THE DOCK & HARBOUR AUTHORITY

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Editorial Comments.

THE PORT OF DORDRECHT.

The subject of this month's Supplement is the Port of Dordrecht, where extensive improvements have lately been undertaken in order to facilitate and to accommodate the increased requirements of shipping trade which enters the port.

The history of this port dates back to the thirteenth century when it was even then an important centre for shipping, the trade using the port being grain, timber and wine. In those days Dordrecht was a greatly favoured town inasmuch as special privileges were conferred upon it by the Counts of Holland. Chief amongst these privileges was the Right of the Meuse, which enforced all ships sailing up the Meuse with an unbroken cargo having to discharge partly or wholly at Dordrecht. Another privilege was the Staple Right, which provided that all goods carried along the rivers Yssel, Meuse, Lek and Merwede had to be trans-shipped at Dordrecht and also that such goods had to be displayed for sale some days there, and another important privilege was entitled the Market Right under which heading all villages in the southern part of Holland and the northern part of Brabant had to market their horticultural produce at Dordrecht.

These rights naturally increased the importance of Dordrecht as a shipping port and also greatly increased the financial standing of the town.

With the advent of deeper draught ships it was found that in 1870 the approaches to Dordrecht from the sea were not deep enough for sea-going vessels and the outcome of this was that the port lost most of its trade.

In 1918 an Act was passed whereby Dordrecht was to obtain a new waterway to the sea by means of the Old Meuse which runs into the Rotterdam Waterway at Rozenburg. Through the port being in such a favourable position it was selected by the Government at the time of the passing of this Act as a transit port. The town is situated at the junction of four large and deep rivers, also on the great shipping routes from Antwerp to Germany and from Rotterdam to Germany.

When the deepening of the Old Meuse is completed, and, it is considered a minimum depth of 8½ metres will be available in 1929, Dordrecht will be able to cope with sea-going vessels of a draught up to 8 metres. To meet the requirements of this future trade extensive improvements are being constructed for the trans-shipment of cargoes. Chief amongst these being the construction of new quay walls, up-to-date electric transporters and a shed for general cargo. Storage yards are also being laid down which will cover an area of upwards of 20,000 square metres and four railway lines are also to be constructed across these yards.

When all these improvements are completed Dordrecht should once again be the great trans-shipment port that it was in the past.

NEW GRAIN WAREHOUSE AT THE PORT OF LEITH.

The Port of Leith, which is situated just inside the entrance to the Firth of Forth, and is also the Port for Edinburgh, have, through the steady increase of the grain trade in the port, had to lay down a new grain warehouse.

In 1903 a grain warehouse was laid down at Leith by a private firm and it was taken over by the Leith Dock Commissioners in 1906. This warehouse is capable of holding 20,000 tons of grain, and the new warehouse, which was opened on Friday, July 20th, 1928, adjoins this older building.

The new warehouse, which is built entirely of re-inforced concrete, is connected with the old one by means of a covered way, and is arranged so that the two can operate together.

The storage capacity of the new building is 16,000 tons, which comprises 55 silos, each of about 12-ft. 6-in. by 14-ft., holding 1,000 quarters, and 32 silos, each 14-ft. by 6-ft. 3-in., holding 500 quarters of grain, all approximately 77-ft. high.

A series of 24 delivery silos, each holding 500 quarters of grain, constitutes the delivery section, with an elevator tower about 150-ft. high above the ground level, which is provided with seven floors to carry the machinery, appliances, etc., for the handling of the grain.

A new electric sub-station was constructed adjacent to the new warehouse for the purpose of supplying the additional electric energy required.

NORTH SEA CANAL.

"Navigation on the North Sea Canal" is the title of a brochure which has been issued by the Municipality of Amsterdam, to show that vessels of from 10 to 20,000 tons gross can make a safe passage through the canal from Ymuiden to Amsterdam without hiring tugs given normal conditions.

The illustrations show the canal illuminated by night and also a large number of vessels making the transit, with particulars of flag and tonnage. A conspicuous example is the German s.s. "Polonio," gross tonnage 20,576, passing through the main locks at Ymuiden, which is 82-ft. wide.

The booklet should engage the attention of shipmasters not conversant with the possibilities of the waterway. Although the work is necessarily pictorial in character, the addition of a regional depth table would lend added force to an otherwise exceedingly logical appeal.

BARRY AND PORT TALBOT.

Barry and Port Talbot are situated on the South Wales Coast between Cardiff and Swansea, and their docks are likewise under the united control of the Great Western Railway Company, to whom we are indebted for the following details of new works effected since the change of administration.*

The Barry Docks are 114 acres in extent, with a deep water entrance lock 647-ft. in length and 65-ft. in width. There is 50-ft. of water on the outer sill on high water of spring tides and 41-ft. at neaps. There are 41 coal hoists. At the amalgamation five of the special coal tips for handling 20-ton wagons, had already been installed and the number has been increased to seven by reconstructing Nos. 23 and 26 at the No. 2 Dock. Over 11,000,000 tons of coal have been shipped at Barry Docks in a single year.

Two large warehouses which were erected by the Government during the War, have been purchased, and afford excellent accommodation for general cargo and other traffic requiring storage. Large flour mills have been erected at the docks and vessels bringing full cargoes of wheat are berthed alongside, and the grain discharged direct to mills by elevators. A large cold store on the south side of No. 2 Dock is capable of storing 80,000 carcases of mutton. Transit sheds have a floor area of over 400,000 sq. ft. Three large dry docks communicate direct with the wet docks. Improvements include a new electric lighting and power installation, which has replaced the older plant.

Port Talbot is situated on the south-east side of Swansea. The docks are about 67 acres in extent with access from the open Channel by an entrance lock 450-ft. long by 60-ft. wide. There are nine modern coal hoists, four of which will handle 20-ton wagons. Two of the three conveyor belts have been reconstructed, and will also ship coal from the large wagons. Extensive wharves are provided for traffic other than coal, and are equipped with modern hydraulic cranes with transport sheds and siding accommodation. The deep water area of the port has been considerably extended by dredging operations.

Improvements include a new wharf opposite Messrs. Baldwin's works, to accommodate the iron ore and general shipment traffic in connection with these works. The Talbot Wharf, where the bulk of the iron ore, pitwood and other heavy traffic is dealt with, has been reconstructed. The North Pier, to the northern side of the entrance channel to Port Talbot Docks, which had got into a bad state of repair, has been entirely reconstructed and considerably improved. Other important works, including the provision of new engines in the hydraulic power station, a new steam launch for the ferry service, and the improvement of dock running lines have also been carried out.

* "New Works and Facilities at the South Wales Ports." "Docks of the G.W.R."

Notes from the North.

MILLION POUNDS DOCK IMPROVEMENT.

Having cost £1,300,000, the new entrance to the Birkenhead system of docks, which was officially opened by Lord Derby, is a notable event in the dock annals of Merseyside. The entrance to the Birkenhead Docks from the river is through a kind of lobby, the Alfred Dock, from which narrow channels lead to the spacious anchorage of the East Float, the Wallasey Dock, and others. The Alfred Dock when first opened in 1866, had three entrance locks from the river; one of 100-ft. width, one of 30-ft., and one of 50-ft. At that time the maximum draught with which a ship could enter was little over 24-ft.; the present maximum draught is 32-ft. 6-in. The 100-ft. lock was deepened in 1902, but even so a vessel of maximum draught or nearly so, could use it only on 144 days of the year. The new lock has been made by knocking the two small entrances—the 30-ft. and 50-ft. locks—into one, 80-ft. wide and deep enough to be used nearly all the year round by vessels of the maximum draught. Smaller vessels will be able to use the lock actually for six hours on every tide. It will thus become possible for East bound vessels via the Suez Canal to leave Birkenhead loaded to their full capacity.

This enterprise is the fourth large dock development with which Mr. T. M. Newell, who recently retired from the position of engineer-in-chief of the Dock Board, has been associated during the last fifteen years.

The work comprises the provision of a new 80-ft. lock, which provides a depth of water of 40-ft. 4-in. at high water of ordinary spring tides, as compared with a depth of 36-ft. 7-in. in the case of the deepest previous entrance to the Birkenhead system of docks—namely the 100-ft. Alfred Lock. The second part of the work embraced the closing of the old 50-ft. and 30-ft. passages between the Alfred Dock and the East Float and the provision of a new 80-ft. passage having a depth of 5-ft. below Bay Datum, the previous depth being 1-ft. above Bay Datum. The equipment includes three pairs of steel gates, each leaf weighing about 210 tons. The gates are operated by hydraulic machinery of the most modern and serviceable type, similar to that at the recently completed Gladstone Docks, Liverpool. Gangways for pedestrians have been provided over two sets of gates. Special sills and quoins have been provided so that in the event of the lock requiring to be dried for repairs, the working gates can be reversed and used as dams. Hydraulically operated sluices are provided for controlling the discharge of water into the lock for levelling purposes, the influx being distributed over the whole length of the lock, in order to avoid disturbing ships waiting to be locked through. The lighting is electric and the equipment includes beacon lights 90-ft. high, which will remove all difficulties attendant on the use of the lock at night time.

The opening of the new entrance was celebrated by a luncheon given by the Mersey Dock and Harbour Board, on the Blue Funnel "Sarpedon." Mr. R. H. Holt, Chairman of the Dock Board, who presided, said that in 1902 the total tonnage of vessels, in what they knew as the Birkenhead system, was 1,420,946 tons, whereas last year it had grown to 2,375,671 tons, and that the eastern outward trade which was, perhaps, the most important part of the Birkenhead business, had risen from 627,993 tons to 1,353,433 tons. That was not a bad increase for 25 years. In 1866 he found the maximum draft of any ship entering the Birkenhead docks was 24-ft., in 1928 it had increased to 32-ft. 6-in., and although the entrance in 1902 was an improvement on the old entrance just to the north, there were only 144 days in the year when a vessel drawing 32-ft. 6in. could leave the dock. Now there were 341 days for the new entrance they were just going to open. That was a considerable step forward and it was not only the big ships that obtained that great benefit but also the smaller ships of less draft, which had a very great advantage because they were able to work on a much longer period of the tide. There would be 26-ft. of water on the entrance at half tide; that meant that any ship drawing less than 26-ft. would have six hours on every tide in which they could come in and out of the dock, and very frequently they would be able to save a whole day's work which they would have lost. These improvements meant real economies for the working of the port and they saved more money by such improvements than by any reduction in the charges.

Lord Derby said he was glad to hear the Chairman say two things; one was that Merseyside had a common interest. Merseyside was not four separate entities, it was one, and the more they could pull together and the closer they could operate, the better it was going to be for all of them, for closer co-operation meant efficiency and economy.

The Mayor of Birkenhead linked up the opening of the new lock with the development scheme of the Great Western Railway, and the Mersey Tunnel, which would all add to the trade of Birkenhead. He looked to the Dock Board to provide further facilities to meet this increased trade.

The Blue Funnel liner, "Sarpedon," outward bound, had the honour of using for the first time, the new 80-ft. river entrance to the Alfred Dock. A large company witnessed the breaking of a ribbon stretched across the lock as the vessel steamed slowly towards the river.

PORT TONNAGE RETURNS.

The writer is informed by the Mersey Docks and Harbour Board, that foreign import cargoes at Liverpool and Birkenhead during the month of June amounted to 572,460 tons, of which 298,000 tons was transferred by horse, cart, or motor lorry to local warehouses, factories and mills, 20,000 tons to local railway stations, 21,400 tons to foreign and coastal shipping berths, 734 tons to canal depots, 900 tons to barges, and 1,100 tons to other destinations, making a total volume of inward traffic, horse or motor hauled, of 342,134 tons. The clearances from the dock estate by road motor transport to outside districts amounted to 31,472 tons. It is interesting to note that by far the greatest bulk of inward tonnage is cleared from the docks by road transport vehicle. Rail hauled traffic accounted for only 24,500 tons despite the fact that there were railway facilities at the docks from which 444,240 tons or 77.6 per cent of the total traffic was removed.

NEW GROYNE WORKS AT LLANDUDNO.

Llandudno's sea defences have been the subject of a Ministry of Health inquiry at Llandudno where the Council has advised application for sanction to borrow £11,637. Sanction has been already given by the Government for part of the work to be undertaken prior to the holding of the inquiry, and several groynes have been erected at the West Shore for experimental purposes, and have so far proved satisfactory. The present scheme includes the erection of groynes at both North and West Shores, and also the heightening of the sea walls. On this latter point there is a divergence of opinion, the majority of the Council apparently being in favour of merely building the groynes in the belief that there will be sufficient to obviate the danger. Mr. W. T. Ward (Surveyor) reported that wooden groynes had been tried about 1912, but had to be taken down as useless. Owing to the nature of the Llandudno bay, which had the Ormes going into deep water at either end, there was no source from which fresh shingle would be carried by tides to replace loss. At present, gentle winds had caused shingle to be carried from the east to the west end of the bay, which was all to the good, but unfortunately in the long run, the tendency resulted in the bay losing more than it gained. He hoped that in the placing of the new form of groynes at an angle towards the line of travel would have a beneficial result. It had been tried successfully at the West Shore. He attached considerable importance to the type proposed which was a triangular groyne with a curved top. The Council were of opinion that at present the work should be confined to the groyning without going to the more drastic heightening of the sea wall. It was 30 years since the sea came over the promenade to go into the town. The new type of groyne which had been experimentally used at the West Shore consisted of boulders contained in iron mesh. In a few months the results had been very encouraging.

ONLY ONE VACANCY.

The Docks and Quays Committee of the Mersey Docks and Harbour Board has decided that the whole of the berth and shed accommodation at the north side of the Gladstone branch dock No. 1 be appropriated to the use of the steamers of the Canadian Pacific Steamships Ltd., in lieu of their present accommodation at the north side of the Gladstone Dock. This means that there is only one unappropriated berth left in the dock.

CRITICISM OF DOCK BOARD.

Frank criticism of the Mersey Docks and Harbour Board with respect to charges on goods from abroad, which have previously paid dues at some other English port, were uttered at the meeting of the Council of the Chamber of Commerce. The Transport Committee reported that a complaint had been received from members that Indian wool discharged from the steamer at Glasgow, and sent by coastwise steamer to Liverpool, had been charged foreign dues at Glasgow and again at Liverpool. Representations to the Dock Board were unavailing. Mr. J. A. Irving said it was an absurd position for the Dock Board to take up. There was no objection to the Dock Board charging foreign dues on through bills of lading, but when a man lands goods in London and looks round for a home in which to place them he looks at Liverpool and says: "If I send them there I must pay foreign dues on them again." Naturally he did not send them to Liverpool. Lieutenant-Colonel Buckley, who is a member of the Dock Board, said he understood the charge was statutory and the Board had no option. Mr. R. V. Edwards, Chairman of the Transport Committee said that the Board could waive the charge if they wished. Coffee which had arrived in Garston had been barged to Liverpool. As soon as the barges arrived alongside the quay at Liverpool, the goods were charged foreign dues, although they had previously paid them at Garston. Consequently the trade was lost or it was diverted. The hope was expressed that the matter would be again taken up by the Dock Board.

BRINGING DOWN PORT COSTS.

Mersey Docks and Harbour Board has adopted a recommendation to reduce the inward foreign dock rates and town dues

in respect of indiarubber and caoutchouc from 5d. to 3d. per cwt., less five per cent. The point of view which prevailed in committee was that the loss in revenue by the proposed reduction of dues on the present quantity of rubber imported into Liverpool would be more than balanced by the additional quantities which they hoped to receive if the Dock Board and the interests directly connected with rubber made some substantial reduction in present charges.

MORE MONEY WANTED.

Mersey Docks and Harbour Board has decided to increase the rate of interest for loans to 4¾ per cent. per annum for periods of three years and less than five years, and 5 per cent. per annum for periods of five to ten years. It was explained at the Board meeting at which this decision was reached, that when the rate was reduced to 4¾ per cent., the board hoped that money during the summer would be cheaper, that the bank rate would possibly be reduced, and that they would be able to borrow at 4½ per cent. Unfortunately, stringency had appeared elsewhere, particularly in the American market, and they were offering rates below those of other bodies. The board was not getting as much money as it wanted. Hence the increased rate now offered.

TENDER ACCEPTED.

Wallasey Corporation have accepted the tender of Messrs. Cammell, Laird and Co., for the supply of three pontoons; two at Seacombe to cost £1,820, and one at New Brighton, for £785. The pontoons for Seacombe ferry are to be 90-ft., and at New Brighton, 55-ft.

REPAIRS TO TRAFFORD BRIDGE.

Repairs are being carried out on the 2,000 tons Trafford swing bridge, Manchester. The bridge has worn its rollers and its roller paths and the wear and tear is to be repaired. Four hydraulic jacks were employed to lift the bridge the required number of inches.

DOCK BOARD REFUNDS.

The appeal lodged by the Mersey Docks and Harbour Board in 1925 against the increased assessments of various portions of the dock estate in Birkenhead has now been settled and the board has become entitled to a refund of amounts totalling £4,479 in respect of the rates for the years 1925 to 1928.

"PENNY" BRIDGE.

Birkenhead Corporation has decided to endeavour to open negotiations with the Mersey Docks and Harbour Board with a view to the removal of the tolls on the "Penny" Bridge at Poulton between Birkenhead and Wallasey. This bridge formerly belonged to the Vyner estate, and was bought by the Dock Board a few years ago, together with the area known as the Bidston Moss. Tolls have been paid for passage over the bridge for generations, and recently the Mersey Docks and Harbour Board erected a large swing bridge in place of the old wooden structure.

STABILITY OF SHINGLE.

In the course of an address on Fleetwood defences, given to the members of Fleetwood Rotary Club, Mr. W. Melville, engineer and surveyor to the local council, declared that at intervals of approximately 30 years during the last five centuries, an extraordinary combination of tide and wind had produced great inundations along the coast of Lancashire, and the tidal effect of those and earlier attacks had probably resulted in the formation of the broad expanse of Morecombe Bay. Mr. Melville described the sea defence work at present under construction on the west side of Fleetwood between Rossall and the rifle range, where the tide broke through last October and caused a great flood. He said the reason for their faith in the stability of those works was because there had for centuries been a continued supply of shingle washed up on that part of the coast. There was no reason to suppose that that supply of shingle would suddenly cease, but would gradually accumulate, and ultimately prevent the sea even reaching the concrete wall.

A NEW CATALOGUE.

A very well-produced and profusely-illustrated catalogue has just been issued by Messrs. Siebe, Gorman and Co., Ltd., the well-known safety and submarine engineers, of 187, Westminster Bridge Road, London, S.E.1.

The catalogue contains a full list of breathing and all other safety, protective and first aid appliances and a copy should be in the hands of all dock and harbour authorities, as there are many things of interest in the book which should prove very useful to them.

Copies of this catalogue can be obtained on application to Messrs. Siebe, Gorman at their address as above.

Dublin Port Inquiry Concluded.

After sitting at 23 ports and examining hundreds of witnesses, the Irish Free State Ports and Harbours Tribunal concluded its public work on the 10th July last, when the inquiry into the work of the Dublin Port and Docks Board came to an end.

Mr. P. J. Lawrence, Chairman of the Dublin Port and Docks Board, attended each session of the Tribunal while it sat in Dublin and received a cordial vote of thanks from his colleagues.

DUBLIN CHAMBER OF COMMERCE.

Mr. John Eason, on behalf of the Dublin Chamber of Commerce, and representing 900 firms and individuals engaged in commerce, said that under the Board as at present constituted, the Port had made great progress. The revenue of the port was derived mainly from dues on tonnage and on goods. The position, comparing 1914 with 1927 is as follows:—

	Total Income.	Dues on Tonnage.	Dues on Goods.
1914 ...	£104,373	69,930 (67 per cent.)	22,925 (21 per cent.)
1927 ...	£214,114	79,650 (37 per cent.)	94,063 (43 per cent.)

Traders were thus bearing their share of the cost of carrying on the port. This was reasonable and no charge was called for, broadly speaking, and in the long run the consumer paid the cost. On the whole there seemed no reason for changing the *status quo* except as regards such revision of rates as would tend to encourage and develop the export of agricultural produce.

On the shipping side there was apparently a difficulty in adjusting the relative contributions for cross-Channel and overseas tonnage. Traders regarded both as vitally important and if the port was to be worthy of the name, provision had to be made for ships of large tonnage.

As the representation of Dublin Corporation had been reduced, the Chamber of Commerce suggested that the Government should nominate six persons on the Board to represent the Government, Agriculture, Labour, and the general body of citizens. The franchise qualification of electors of the Board was regarded as satisfactory.

Traders, he said, had no reason to think they were handicapped in any serious way by Dublin Port charges.

A PORT MANAGER NOT WANTED.

Replying to Mr. H. B. O'Hanlon, Chairman of the Ports and Harbours Tribunal, Mr. P. J. Lawrence, Chairman of the Dublin Port and Docks Board, said he had heard of some ports being run by general managers, but in his opinion it was a bad arrangement. No ordinary general manager had the qualifications of a Board to analyse the work of the Secretary, Engineer and Harbour Master.

With regard to a municipal lairage at North Wall, Mr. Lawrence said that the necessity for it had not been proved. In Dublin, animals were detained for two hours, but, when as sometimes occurred, the stock were delayed for six or seven hours the matter should be investigated.

NEW B. & I. LAIRAGE.

Mr. David Barry, O.B.E., stated that the new British and Irish covered lairage, with accommodation for 400 cattle, would be completed before the end of the present year. He was, he said, altogether for the overseas trade but he objected to the cross-Channel trade having to carry it on its back.

Mr. Lawrence disagreed with Mr. Barry as to overseas trade being favoured at the expense of cross-Channel.

STEVEDORES' EVIDENCE.

Mr. Michael Carrig, stevedore, stated that the charges for discharging cargo at the port were regulated by the Stevedores Association of Dublin. The men employed were paid each night. There were 6,000 casual labourers at the port, where there was work for about 2,000. With two days employment per week, their average earnings came to £3 per week.

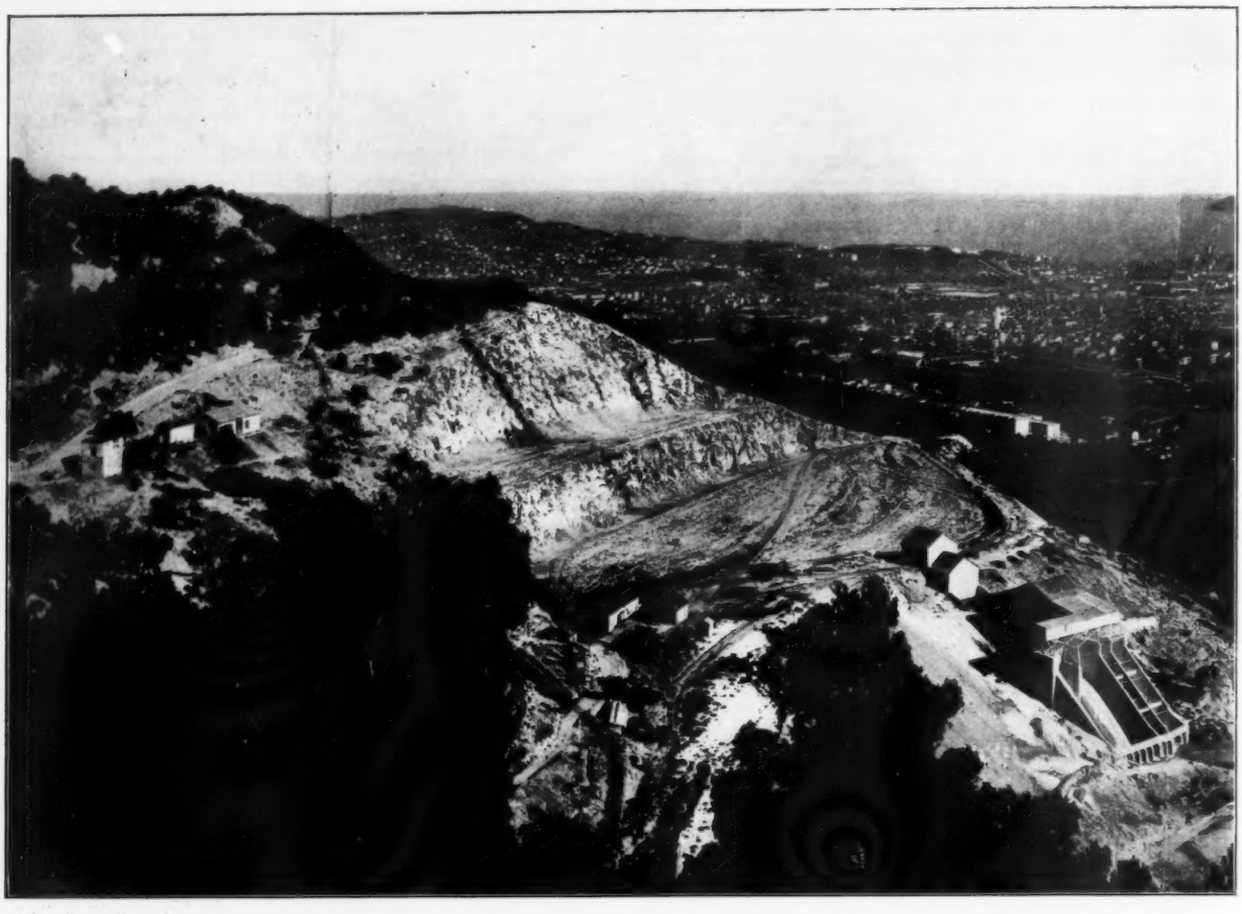
Mr. Sydney Watson, of Messrs. Newman and Co., stevedores, said that a grain cargo of 6,000 tons would cost about £350 to unload and the work would occupy twelve days. The methods of discharge in Dublin were good.

Mr. David Barry, in re-examination, said he did not think the decasualisation of quay labour was possible in Dublin. The B. & I. Coy. in January 1927 had taken on about eighty men on a permanent basis, and it had worked satisfactorily, but at Liverpool the system had worked badly. The trade unions had made the Port of Dublin a close borough for themselves, and because of these regulations, hundreds of men could not get employment.

With regard to freights, the present rate for cattle from Dublin was 16s. 6d. per head. It would have been more but for the saving effected by the amalgamation of the shipping companies. It would be 2s. 6d. less if the shipments of cattle were distributed evenly over the week, instead of being concentrated on Thursday.

The members of the Tribunal were:—Mr. H. B. O'Hanlon, Mr. M. Deegan, Mr. Charles H. O'Connor, and Mr. H. Baxter, Secretary.

The Port of Toulon.



General View of the Toulon Road, the "Faron" Quarry and Plants, whence Building Materials were despatched to Road Banks.

The Two Groups of Docks surrounded by Reclaimed Ground.

New Toulon Graving Docks.

INTRODUCTION.

THROUGH the courtesy of Messrs. Fongerolle, the contractors, we are able to give the following particulars about the big Toulon Graving Docks, which they have just recently completed—and we hope to publish later on a more detailed account of the building process.

DESCRIPTION OF THE DOCKS.

The new twin graving docks, which have an entrance at each end, are located outside the south sea wall of the "Darse Neuve," within a 500 by 450 metres reclaimed area (see plan of Toulon Harbour) and have the following dimensions:

DIMENSIONS OF EACH DOCK.

	metres.
Length (outside)	442
Length (within the floating gates) ...	422
Breadth (outside)	50.60
Breadth (inside) (bottom)	36
Breadth (inside) (top)	40.6

Both gate sills are 12 metres below the zero of the marine charts.

The docks axes have a N.S. direction and are 100 metres distant from one another.

A channel, dredged to a depth of 12.50 metres below the zero of the marine charts, leads from the deep waters of the "Petite rade" Road to the South entrances; while access to the North entrances is through the "Castigneau" Channel and the "Darse Neuve" basin.

Each graving dock is divided into two by means of an intermediate floating gate, which can be placed at three different sills and gives to the section the following lengths:—

	Length of one Section.	Length of the other (Either North or South.)
1st sill	210 metres	210 metres
2nd sill	235 metres	185 metres
3rd sill	260 metres	160 metres

The four graving docks thus obtained are entirely independent from one another; one pumping plant is, however, used for all of them.

The bottom of the dock is 13.40 metres below the zero of the marine charts, and is fitted with three rows of concrete keel blocks, which will stand the weight of the biggest men of war.

Men of war, which are heavier per metre length than merchant vessels are indeed expected to use the docks a great deal more than the latter. Each side wall is provided with step ladders and three receding platforms at the following depths—2.50, 7 and 12-metres respectively.

Round the docks are large reclaimed areas lined with quay walls made of artificial blocks, set on foundations 10.50 metres below the zero of the Marine Charts.

PUMPS.

The pumping plant, which can be connected to any of the four docks, consists of four turbines; each one is driven by a 445 h.p. electric motor at the rate of 300 revolutions per minute, and can suck 13,000 cubic metres of water per hour.

One group of two docks, which has a capacity of about 280,000 cubic metres, may therefore be emptied in less than six hours' time.

Each of the four docks is connected to a central well by water drains, built in the side walls, and fitted with appropriate sluices; for emptying a dock the water is pumped out of the well after the required sluice has been opened.

Water inlet channels are located on both side walls, close to the North and South entrances; the dock may be filled with water within one hour.

THE WORK.

In 1911 several firms of contractors were asked by the Ministry of the Navy to send out estimates and suggestions for the realisation of the graving dock scheme. The contract was awarded to a group of three firms of contractors: "La Société des Grands travaux de Marseille," "Dayde & Co." and Fongerolles Brothers.

BUILDING PROCESS.

Each group of docks is made of two separate metallic caissons, 242 and 198 metres long respectively, which were built on land near the shipyards of "La Seyne," in the Toulon road.

The ground on which the caissons were built was below the sea level, and had to be protected by a cofferdam. When caissons were complete the cofferdam was removed and the water let into the building yard; the floating caissons were then towed to the required place and sunk in a specially dredged berth, through, first loading them with masonry walls and bottom, and finally letting in water till they rested on the bottom of the berth.

The building of the bottom and side walls had to be carried on very carefully so as not to deform the caisson or interfere with its good balancing.

CONVEYANCE OF MATERIALS TO THE CAISSONS.

Materials for making concrete were brought from large quarries and crushing plants located on the slopes of the "Faron" Hill, 4 kilometres away from the docks, as the crow flies.

Bogies conveyed the materials to the stone crushers and sieves; gravity made them afterwards accumulate in large silos and fall into the many buckets travelling on a 5 kilometres long table way, linking the quarry to storing hoppers located at "Milhand" on the road shore.

Barges were filled from the storing hoppers and towed to the caisson sides.

Toulon Inner Roadstead and Basins, showing the position of the recently-completed Graving Docks.

DISTRIBUTION OF MATERIALS TO ALL PARTS OF THE CAISSONS. TRAVELLING BRIDGE CRANES WHICH MAKE AND DISTRIBUTE CONCRETE.

Three 22 metres high and 72 metres long bridge cranes travelled on rail tracks laid on the bottom of each caisson. Grab buckets were used for unloading the materials from the barges into hoppers, carried by the bridge itself; below these hoppers in the bridge's legs were electrically-driven concrete mixing plants; the concrete finally fell into a bucket carried by the crane to the required place.

All handling of material, from the quarry to the place where it was to be laid was therefore carried on by machinery.

The total average output of the concrete mixing plants was 500 cubic metres of concrete per day: it occasionally reached 800 cubic metres.

BOTTOM AND SIDE WALLS OF THE DOCK.

Concrete blocks were cast under the caisson through diving bells and thus made a strong foundation uniting the dock to the bottom of the berth. The side walls are made of concrete their outer face being paved with artificial block set into place by means of a floating crane.

The total volume of masonry is 500,000 cubic metres.

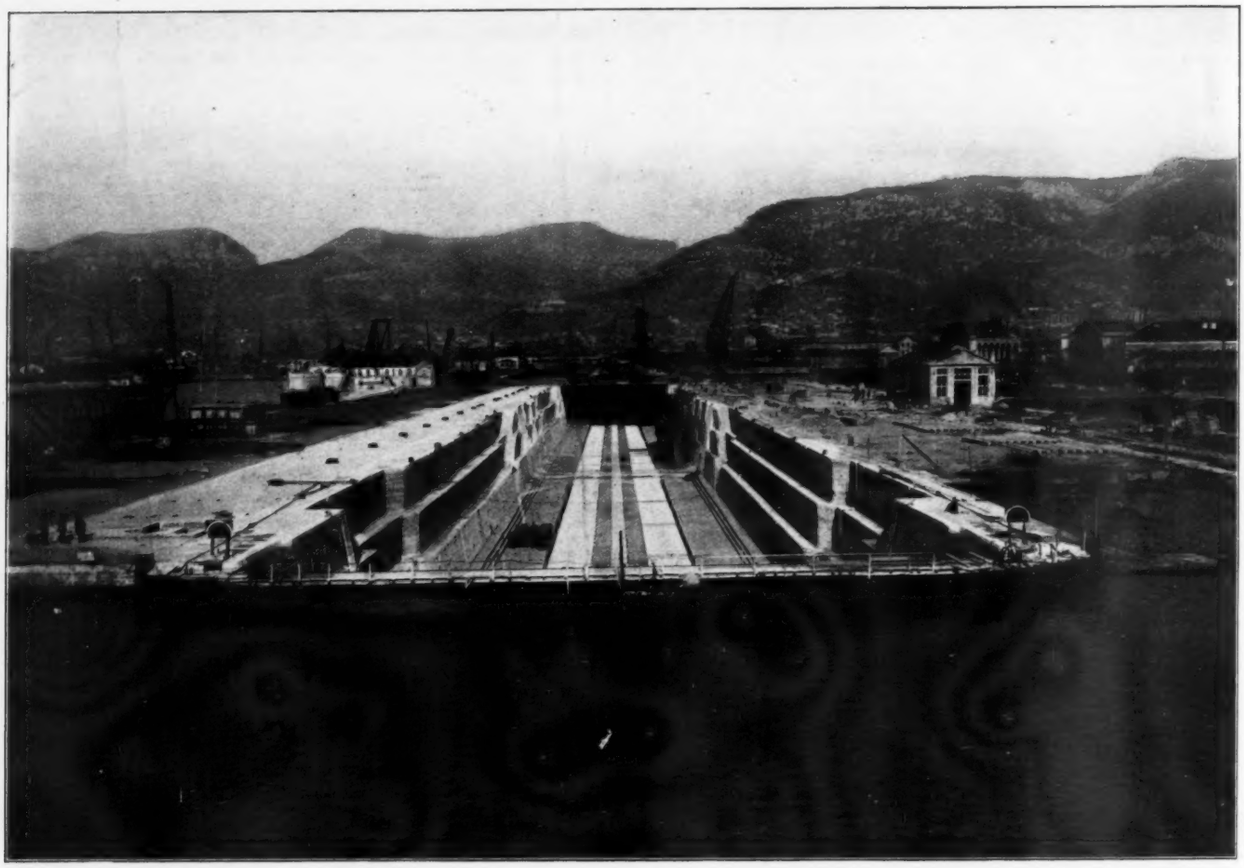
BUILDING EXPENSES.

The total cost has been approximately 140,000,000 francs. The work was begun in 1911 and stopped from 1914 till 1916.

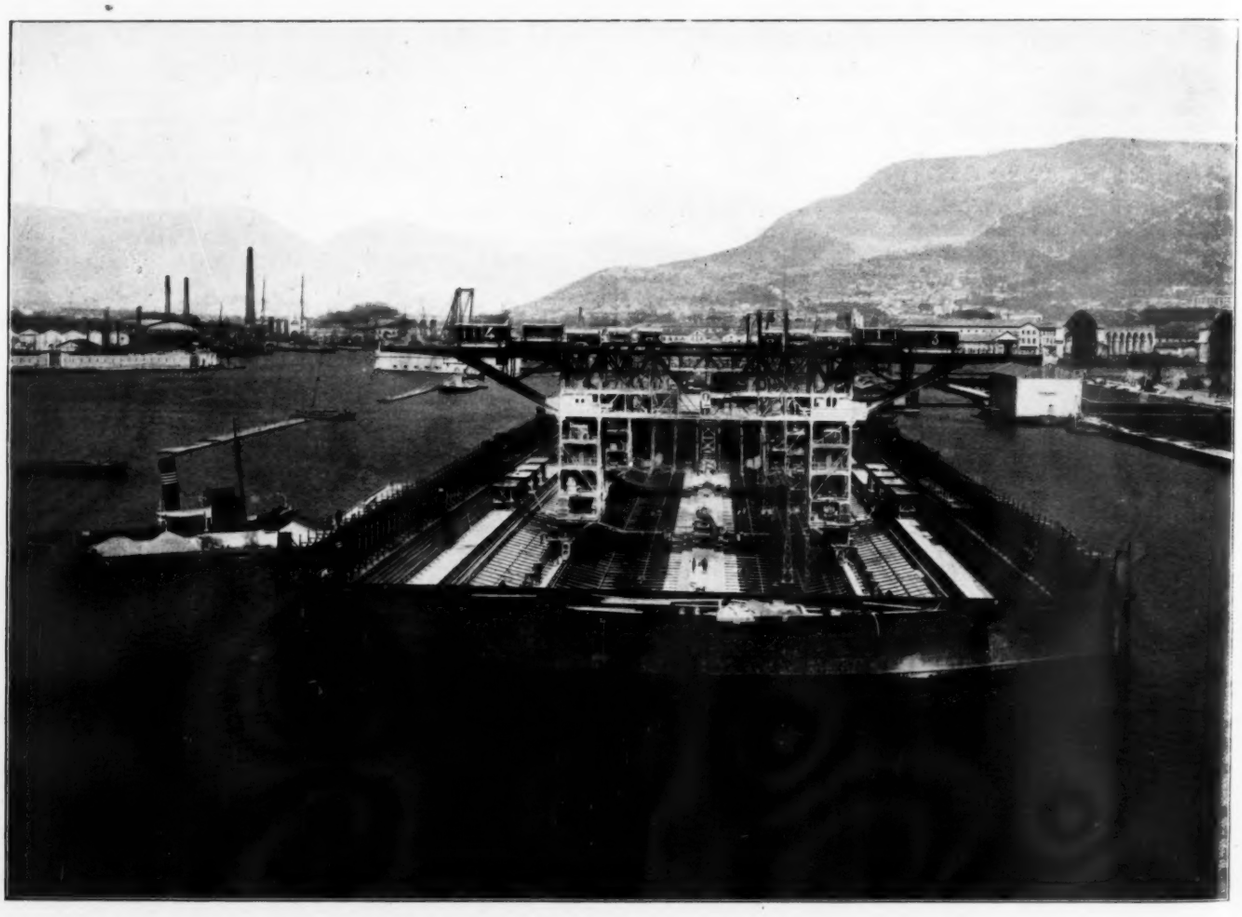
ENGINEERS WHO HAVE CONTRIBUTED TO THE WORK.

Mr. Bouvier (Head of the Engineering Department of Fongerolles Brothers); M.M. Constolle, Voisin, Théron, Herzog and Combarnous (Inspécteurs Géneraux des Ponts et Chaussées) and Mr. Yung.

The Port of Toulon.



The West Graving Dock, now nearing completion, the masonry work being almost finished. The Ground between the Docks is being reclaimed. The Building on the left side of the East Dock houses the Pumping Plant.



The South Metallic Caisson of the West Dock is being carefully sunk by the building of masonry work. Inside the Caisson are several of the Travelling Bridge Cranes which carry concrete mixers inside their supports.

Synchronous Induction Motors.

Starting-up Problem. Use of Rotor Connections.

Increased attention is being devoted in Europe to the merits of the synchronous motor for improving the power factor of industrial systems, and, with the extending popularity of this type of motor, the leading electrical engineers are devising methods for overcoming the difficulties involved in starting. In order to increase the field of usefulness of the synchronous motor many attempts have been made to improve its starting and running characteristics, and a large number of more or less complicated inventions demonstrate the fact that the difficulties met with are not to be surmounted too easily. In this connection, it was no very great step to try to modify the induction motor in such a way that it could be run as a synchronous one, and the tests carried out have demonstrated the practicability of such machines.

One of the European firms which have devoted considerable attention to this question is that of Brown-Boveri, which concern carried out tests with motors connected in various ways, and finally decided to adhere in principle to the arrangement of rotor connections proposed by Danielson as far back as 1902, since it has proved the most satisfactory as regards starting and synchronizing conditions, while general operation is thoroughly satisfactory.

The diagram of connections adopted by Brown-Boveri is shown in Fig. 1.* The armature of the exciter is connected in the rotor circuit during starting, which is carried out in just the same manner as with an ordinary induction motor, and the normal full load torque, or even higher values, can be developed without the normal full load current being appreciably exceeded. At the end of the starting period, the shunt circuit of the exciter is closed by means of a contact on the rotor starter, whereupon the exciter generates the necessary pressure, and sends into the rotor a direct current of the value required to pull the machine into step. Synchronizing takes place without difficulty even on a load as great as 100 per cent. of the normal load. On account of the simplicity of the starting operation, skilled attention is not required.

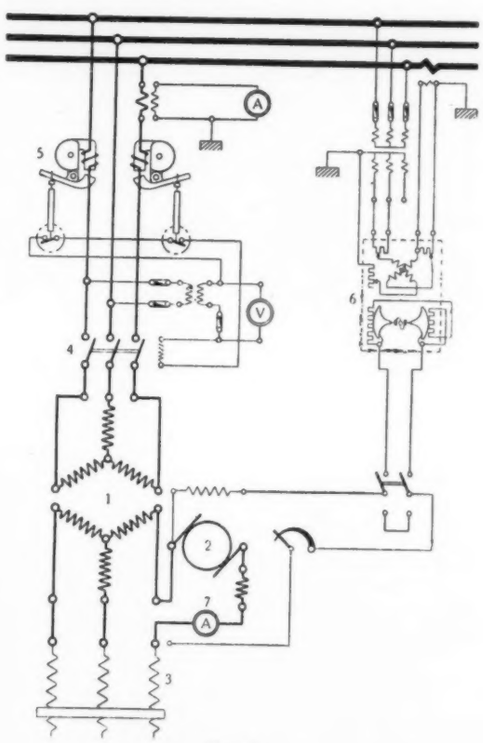


Fig. 1.

1. Synchronous induction motor. 2. Exciter. 3. Rotor starter with switching-in contact for excitation. 4. Stator switch with hand drive and no-volt release. 5. Series time-limit relay with device for tripping the stator switch directly. 6. Automatic power-factor regulator. 7. Polarised field ammeter.

With the ordinary induction motor used as a synchronous motor, however, the magnetizing flux is low compared with the flux caused by the reaction of the armature of the motor, on account of the small air gap, and therefore it is only necessary for a slight overload to occur with a given excitation for the magnetizing flux to be weakened so far that the machine can fall out of step. Such a motor is consequently very unstable under certain conditions. It is, however, possible to render it more stable by small modifications, and thus obtain a machine which is suitable for the majority of cases without it being necessary to employ too large a frame size. When there is a chance of such a motor being subjected to high, sudden peak loads, however, there is no alternative but to provide a machine which can be considerably over-excited, or else to adjust the excitation to the changing load.

This over-excitation generally means the employment of a larger motor, which is then not fully utilized. On the other hand, the adjustment of the excitation to suit the load usually necessitates the adoption of some kind of automatic regulation. It would seem obvious to make the latter dependent upon the variation of the stator current, but such an arrangement is, for certain reasons, neither reliable nor easy to carry out.

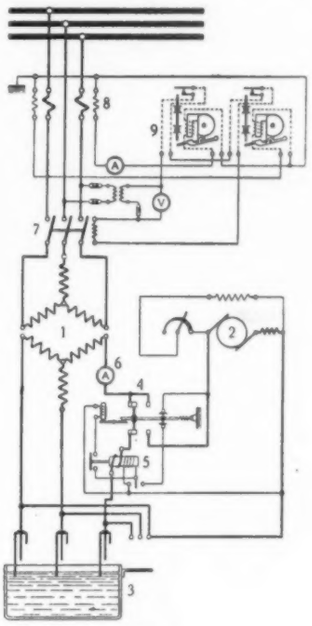


Fig. 2.

1. Synchronous induction motor. 2. Exciter. 3. Liquid starter. 4. Automatic change-over switch. 5. Polarised relay. 6. Polarised field ammeter. 7. Stator switch with hand drive. 8. Current transformer. 9. Overload time-limit relay.

The fact that the motor tends to fall out of step when the excitation is insufficient, that is, with a lagging power factor, gave Brown-Boveri the idea of using an automatic quick-acting power factor regulator for producing the necessary change in the strength of the excitation, its operation being such that the power factor remains constant. With this apparatus very good results have been obtained.

Such a regulator, of which the diagram of connections is given in Fig. 1, enables the motor to take sudden overloads of 70 per cent., or even more, without dropping out of step. It also reduces the excitation losses and the stator copper losses on partial load, and thus improves the efficiency. In cases where frequent and sudden changes of load occur, the automatic regulator enables a smaller size of motor to be employed than otherwise. It can consequently be used to advantage when the operating conditions are severe as regards peak loads, or when the motor must run frequently on light loads, assuming that the machine is not required to take up a large leading current.

The starting connections shown in Fig. 1 are only possible to a limited extent, as the machine is supplied with direct current and brought into synchronism at the end of the starting period without any attention being paid to the relation between the rotor field and the stator field at the moment this is effected. Such a method of starting is especially undesirable with large motors starting against heavy load, since under certain conditions hunting and rushes of current will take place when it pulls into step.

To prevent hunting, which is due to superimposing the direct current on the alternating current of the rotor circuit, the former is brought suddenly to its full value and impressed on the rotor by switching over at the end of the starting period, so that immediate synchronizing is effected. To prevent rushes of current in the stator two conditions have to be fulfilled:—

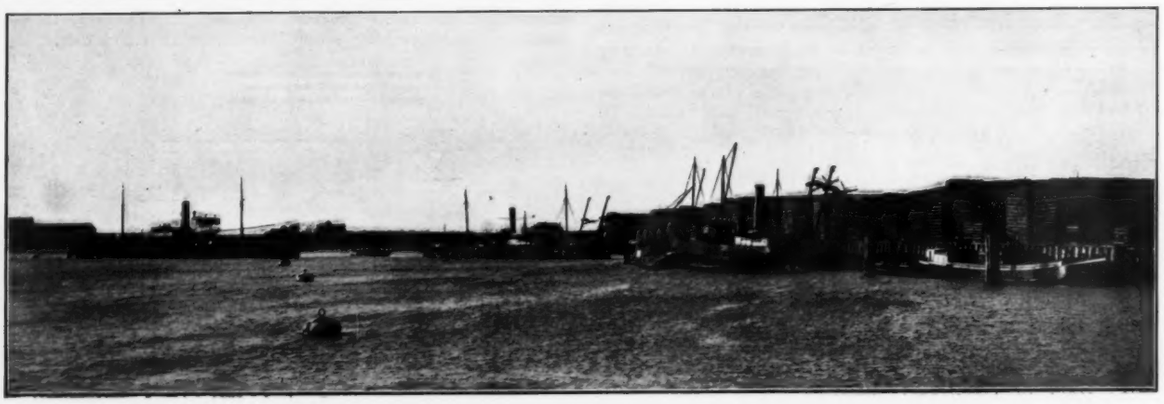
1.—Synchronizing must only be attempted at the moment when the rotor field and the stator field are in the appropriate position with regard to one another.

2.—Switching over must only take place when the rotor field is in accordance with that produced by the direct current.

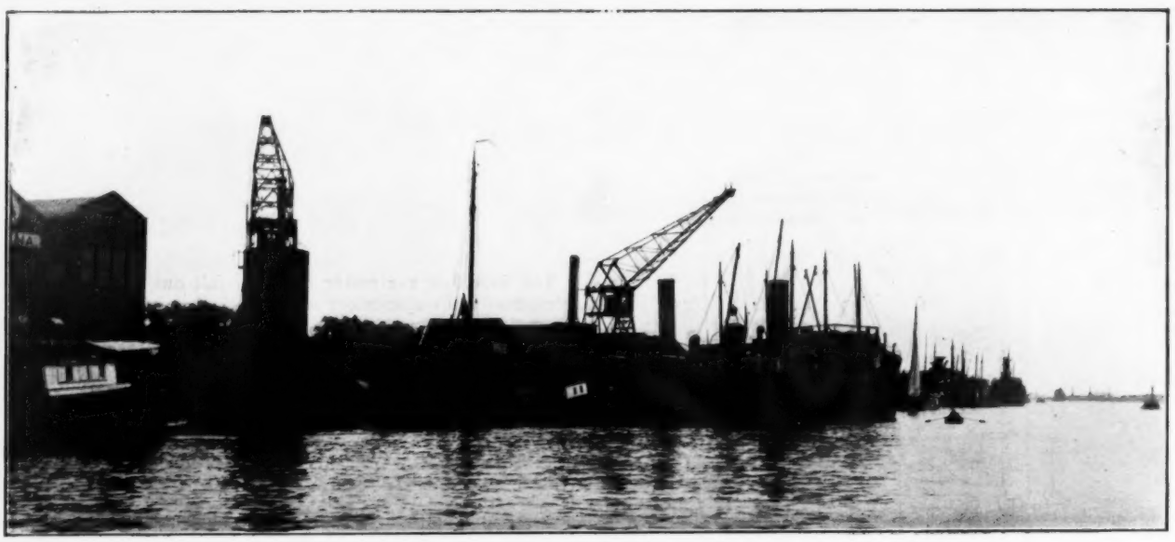
It is consequently necessary to have a polarized ammeter in the rotor circuit, and only to synchronize when its needle stands in a certain place. Switching over at the right moment can also be effected by a polarized relay. The diagram of connections of an arrangement patented and employed by Brown-Boveri is given in Fig. 2.

* Diagrams by courtesy of British Brown-Boveri, Ltd.

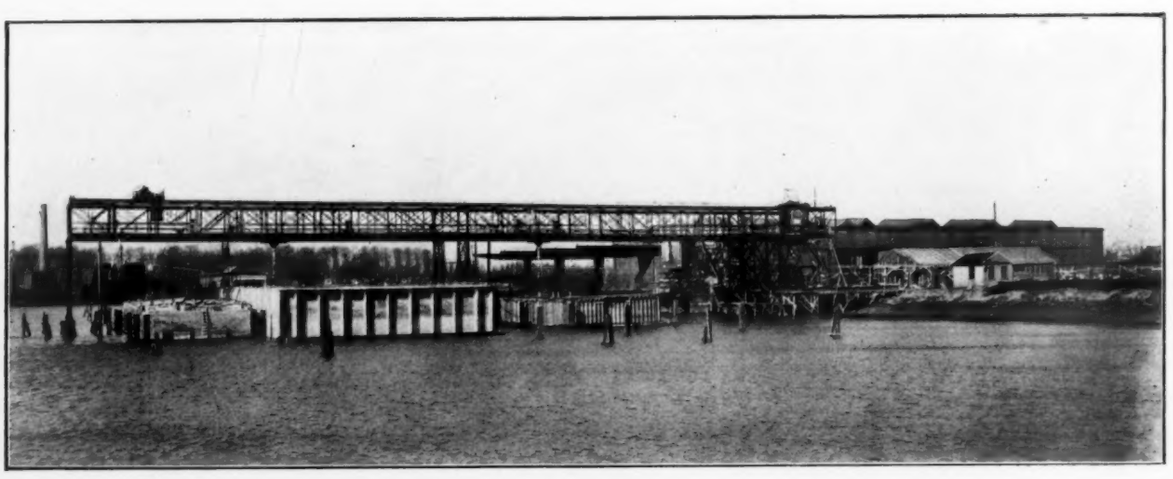
Port of Dordrecht.



Port of Dordrecht.



Loading Coal by means of Steam Grabs.



The Construction of the Caissons in the Dry Dock, by means of a Transporting Bridge.

The Port of Dordrecht.

BEFORE proceeding to a description of the harbour works, as they exist or are under construction at the present moment, it may be desirable for a better understanding to give a short historical survey of the town.

From the earliest Middle Ages Dordrecht, or as it was then called Thuredregt, has been an important centre of trading and shipping. As far back as the 13th century its ships traded the neighbouring seas of the old world, and it carried on a considerable trade in grain, timber, wine, etc.

Its important position was the result partly of its favourable situation and of the spirit of enterprise of its inhabitants, partly of the special privileges conferred upon the town by the Counts of Holland. The chief of these privileges were the Right of the Meuse, the Staple Right, and the Market Right.

According to the Right of the Meuse all ships sailing up the Meuse with an unbroken cargo had to discharge partly or wholly at Dordrecht.

The Staple Right provided that all goods carried along the rivers Yssel, Meuse, Lek and Merwede had to be transhipped at Dordrecht. Such goods had to be displayed for sale for some days there, and only in case they remained unsold were they allowed to be re-shipped for transportation to some other destination.

The third important privilege, that of the Market Right, provided that all villages in the southern part of Holland and the northern part of Brabant had to market their horticultural produce at Dordrecht.

It goes without saying that these privileges did not fail to have a great influence on the development of the town. Dordrecht became an important commercial town, a member of the powerful Hanseatic League, and later on the city having the first vote in the States of Holland.

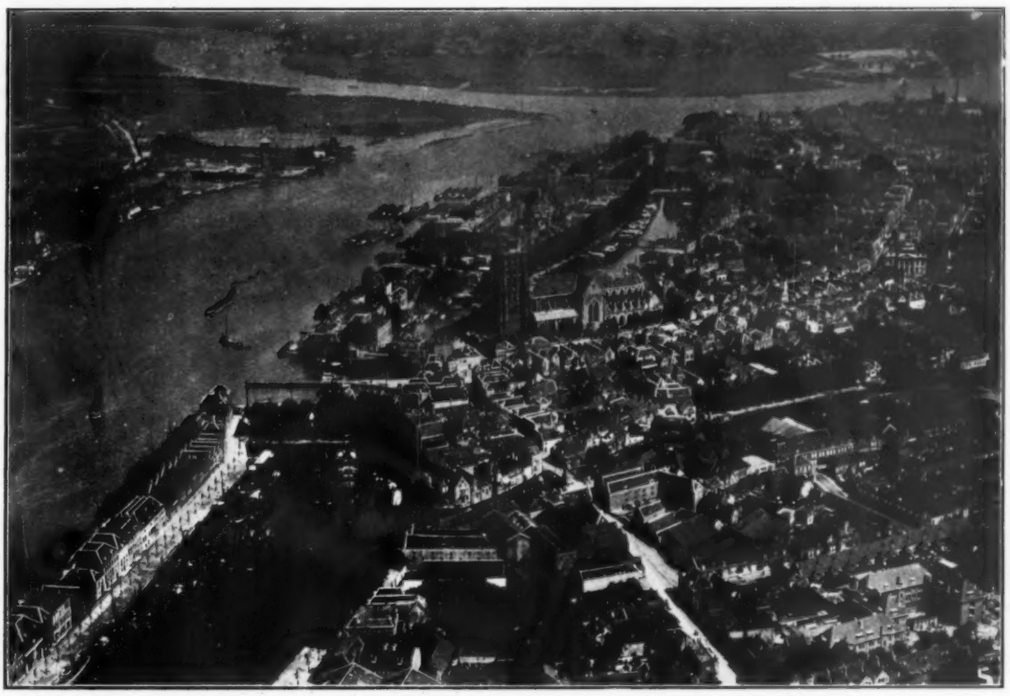
However, though at first the above-mentioned protective rights greatly contributed to the greatness and power of the city, these rights also brought about great decay. Indeed, Dordrecht merchants grew rich too easily; the energy and enterprise relaxed, and when at last, in 1795, the rights were abolished, the downfall came.

A new generation was necessary to regain the lost ground by renewed energy; new relations were established, principally with the Netherlands East Indies, which were promoted by the powerful help of King William I., the founder of the Netherlands Trading Company.

However, this revival proved to be very short-lived. In consequence of the tremendous progress of technical science and the development of steam navigation, ships became larger and larger, and their draught increased, so that in 1870 the situation had become such that the approaches from sea to Dordrecht were no longer deep enough for sea-going vessels.

As long as Rotterdam had to make use of the waterways of Dordrecht, efforts were made to keep the fairway at its proper depth, but as soon as the first-named port had been provided for effectually, Dordrecht was left to its own devices. Endless attempts were made by the Municipality and the Chamber of Commerce to obtain adequate access to the sea, but always in vain. In view of the defence of the country it was deemed inadvisable to increase the number of deep approaches from the sea, which would all have to be protected by fortresses, in order to prevent hostile warships from penetrating into them.

In 1918 a solution was at length arrived at by the passing of an Act by which Dordrecht was to obtain a new waterway to the sea, along the Old Meuse, debouching into the Rotterdam Waterway at Rozenburg. The Municipality of Dordrecht was to contribute 10 per cent. towards the cost of the work.



Bird's-eye View of Dordrecht.

This act has since been carried into effect. Though the post-war depression has considerably delayed the operations, they have now progressed so far that the minimum depth of the Old Meuse is nowhere below 6½ metres, while a considerable portion has a depth of 8½ metres already.

When in 1929 this waterway will be ready, a minimum depth of 8½ metres will be found throughout, so that large vessels drawing 8 metres of water will be able to sail up to Dordrecht freely along an open channel. It is true that there are two bridges across the Old Meuse, but these are tramway bridges with little traffic. In the case of one of them, the Barendregt bridge, water traffic moreover takes precedence of land traffic, so that ships are never detained there. This bridge will be changed into a lifting bridge, with a width of 65 metres and a height of 48 metres, so that it will not offer any impediment to sea-going vessels. The second, the Spykenisser bridge, is a swing bridge, with a width of 25 metres, which is at present sufficient to meet the requirements of the shipping trade, while plans for its reconstruction in the manner of the Barendregt bridge are already well in hand. It should further be noted that the old waterway from Dordrecht to sea likewise has a minimum depth of 6½ metres, so that at present vessels drawing 6 metres can reach the town by two ways.

At the time of the passing of the Act of 1918, Government took the view that the large rivers should be navigable as far inland as possible, in order to enable sea-going vessels to deliver their cargoes far into the interior, sea freights being so much lower than inland freights. This view led to the choice of Dordrecht as being eminently suited for the formation of a transit port. This town is situated at the junction of four large and deep rivers, the Merwede, the Noord, the Old Meuse, and the Kil, and also on the great shipping routes from Antwerp to Germany, and from Rotterdam to Germany, while further it gives access to the broad streams of South Holland and Zeeland, and is the junction of the canals leading to the southern provinces.

From the key map on supplement it will be evident that in the south-westerly part of Holland there is indeed no more suitable place to be found for the transhipment of goods.

When once the waterway along the Old Meuse will be entirely ready, there is no doubt that industries will be established and docks constructed, in the same way as has already been done along the New Waterway and the Noord, in consequence of which the whole island of Ysslemonde will be converted into one great shipping and industrial area, the Hook of Holland port area, at the mouths of the Rivers Rhine and Meuse, with Rotterdam and Dordrecht as its poles.

In order to meet the greatest requirements of the shipping trade, the Dordrecht Municipality decided to increase considerably the existing appliances (chiefly floating), for the transhipment of cargoes, by the construction of new quay walls, most up-to-date electric transporters (loading bridges) and cranes and a shed for general cargoes.

S. HOOGSTRA, Director of the Port.

The western side of the dock, having a length of 280 metres, has been fixed upon for the erection of these appliances. As the length of this quay is rather short, a pier is being constructed parallel to it, at a distance of about 25 metres, by means of which an inner dock is formed for the accommodation of lighters, floating appliances for unloading, and small seagoing vessels. Large vessels are moored along the dock side of the pier.

A similar arrangement is met with in King George V. Dock in London, where however, the concrete pier is provided with open spaces for the passage of lighters, while at Dordrecht it will form one continuous whole.

Both the pier and the quay wall consist of concrete caissons measuring 40 metres each, and divided into parts, which are filled with sand after the caissons have been placed on the bottom.

In order to prevent these caissons from sagging and to give them a solid basis to rest upon, the soft peaty soil had to be dredged to a depth of 12 to 15 metres, where the firm sub-soil was reached, consisting of sand and gravel. The hole thus made was filled up again with sand. After this sand had been left to settle for a considerable time, the bottom of the dock was made level, whereupon the caissons, filled with water, were let down into their places till they rested upon the bottom and were filled with sand. This system of constructing quay walls has, of late, also largely been adopted in the Netherlands East Indies, notably at Sourabaya and Batavia, where the soil is as marshy as at Dordrecht.

The caissons are built in a dry dock specially constructed for this purpose. In this dry dock the moulds are placed and the concrete is poured into them by means of a bridge built over the dry dock. The latter can be moved in all directions by one man, so as to bring the concrete in the places where it is required.

The pier will be 9.75 metres in length, the total height will be 13.75 metres, and the depth of the water along it 9 metres.

On the pier, rails will be laid down for the supports of the electric transporters and for the cranes, while a line of railway will also be constructed upon it.

Next there are storage yards being laid out covering an area of upwards of 20,000 square metres, and offering storage accommodation for about 25,000 tons of coals or 40,000 tons of ore. Four railway lines are to be constructed across these yards, while at their extremity a shed is being built for the storage of general cargo, which measures 80 metres by 22.5 metres. Further storage sheds have been designed on the west side of the yards, along the Maïlegat, but no resolution for the construction of them has been passed yet.

Vessels will be loaded and unloaded by means of four electric transporters with a lifting capacity of 10 tons each. The fore supports of these transporters rest on the pier, the back supports on the shore; the span between the supports is 65 metres. The variable jib, reaching over the vessel to be discharged or loaded is 30 metres in length, so that it will be possible to reach the widest lighter lying alongside the widest steamer. The inner dock can also accommodate two lighters lying side by side, so that three river vessels can be dealt with at the same time, and any delay occasioned by the shifting of these vessels is done away with.

At the back of the transporters a fixed jib will be constructed with a length of 18.10 metres, which will enable the grab to reach the railway line constructed outside the yards. The grab is operated from a revolving cab suspended from the transporter. For hoisting, cab-driving and turning, Déri motors will be used, which have a greater capacity than ordinary asynchronous motors. The velocity at a counter-pressure of the wind of 15 kilos per square metre will be:—1-metre per second in hoisting a full load; 2.5 metres per second in cab-riding; 2.5 revolutions per second in cab-turning at a full load. With this equipment a minimum capacity of 250 tons per hour per transporter will be attained.

For the handling of general cargoes two electric portal slewing cranes with swinging jib are being constructed. As our readers will be aware, the jib of these cranes can move up and down in a vertical direction, while at the same time the load can be moved in a horizontal direction, the crane itself being also able to swing round in the same manner as the old-fashioned cranes. The new cranes will be able to reach over the inner dock, for which the enormous radius of 31-metres is required. The lifting capacity of the cranes will be 5 tons at the smallest radius (15-metres) and 3 tons at the largest radius. Besides for the handling of general cargoes they are also equipped for grabbing, so that if required they can assist the transporters in the handling of bulk cargoes. Like the latter, they are to be fitted with Déri motors.

From the foregoing it will be evident that these appliances will be able to meet the greatest possible requirements, so that when next year they will be completed, the loading and unloading of cargoes can take place with all possible despatch at Dordrecht.

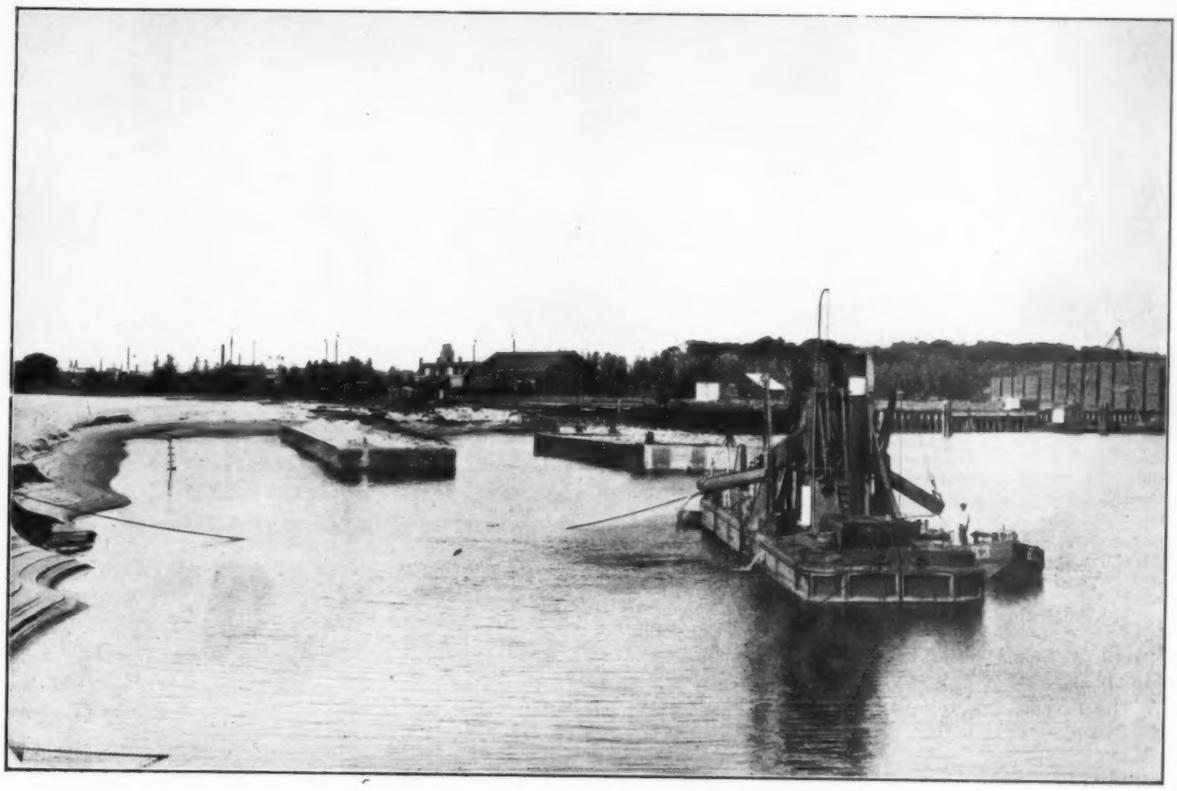
In the construction of these appliances for loading and unloading, attention has chiefly been paid to the working of bulk cargoes from ship into ship, as in view of the situation of the port in connection with the German hinterland mainly bulk transports—ores, coal, sulphates, etc.—may be expected. However, ample facilities have likewise been provided for the storage and for transhipment into waggons, of both general cargoes and bulk goods. As Dordrecht is about to enter upon a new period of development, of which it is impossible to predict in what direction it will take place, both kinds of traffic had to be paid attention to and facilities provided for them.

At the outset of this article we pointed already to the fact that, owing to its favourable position Dordrecht offers many possibilities. Being only 46 kilometres distant from the sea, it is the nearest sea port for the Rhine area, with which it is connected by a deep and absolutely safe waterway. In the immediate vicinity of the town lies the industrial district of North Brabant, for which it is the most conveniently situated port for the importation of raw materials and semi-manufactured products, and the exportation of finished articles. The town is linked up with this district by excellent canals, the Wilhelminakanaal and the Zuid-Willemsvaart. With the Limburg coal basin and the Liege coal and industrial area Dordrecht is connected by the Zuid-Willemsvaart, and as soon as the new Juilanakanaal and the canalization of the River Meuse will be completed, an excellent communication will have been established along the Merwede, the Waal, the Meuse-Waal Canal, the Meuse, and the Julianakanaal.

All these new waterways will no doubt exercise a great influence on the Dordrecht shipping trade, commerce having always been attracted by those places that are most easily accessible, among which this town undoubtedly has to be reckoned, not only in view of its communications by water, but also owing to its accessibility by rail and road.

Dordrecht is the centre of many important international railway connections. There are direct connections with Antwerp, Brussels, Paris; Breda, Tilburg, München, Gladbach, Duisburg; Eindhoven, Roermond, Crefeld, Düsseldorf; Maestricht, Aix-la-Chapelle, Cologne; Nimeguen, Cleve, the left bank of the Rhine; while in a northerly direction there are connections with all important Dutch towns.

Port of Dordrecht.



A Dredger levelling the bottom to berth the Caissons.

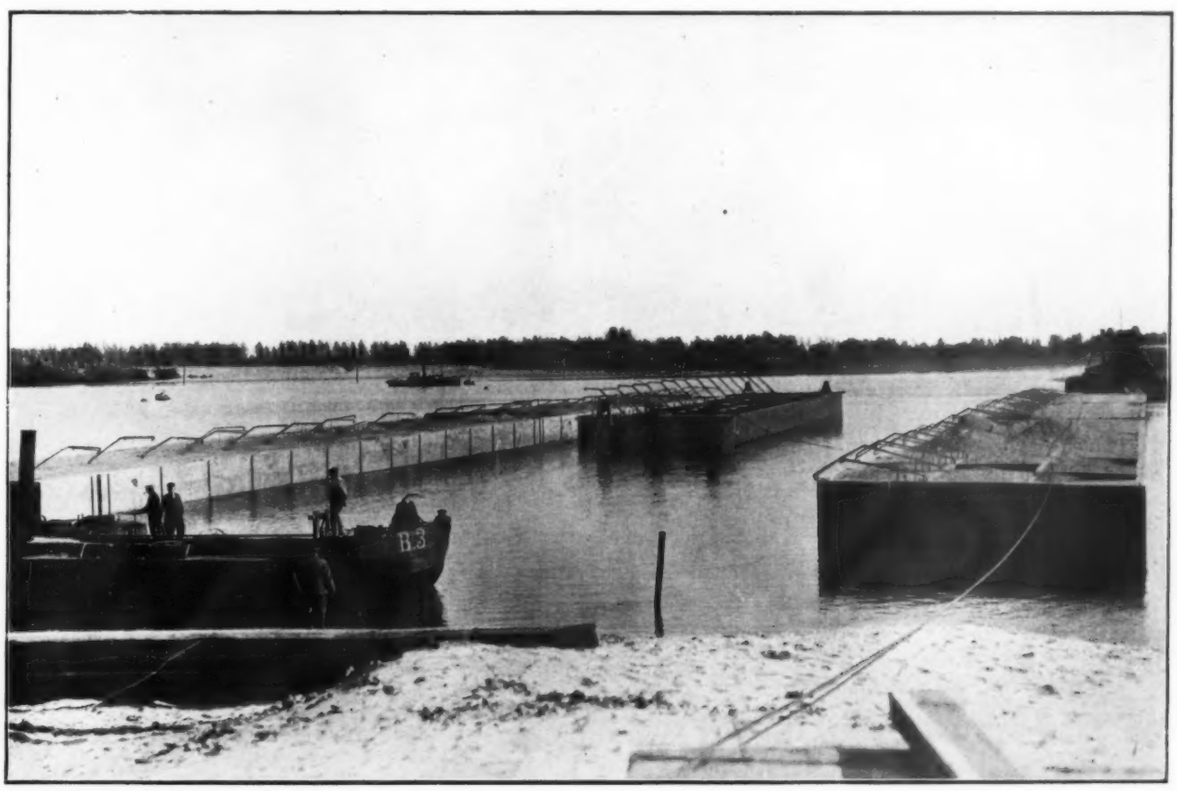


Photo showing the construction of the Pier and the Quay Wall. On the left side, the Pier; on the right, the Quay Wall. Between Pier and Quay Wall, the Inner Dock. A newly-built Caisson is towed in the Inner Dock to be placed against the other.

Dordrecht's situation is equally favourable for motor traffic, owing to its being situated on the great international thoroughfare, Brussels—Antwerp—Rotterdam—The Hague—Amsterdam. The importance of this arterial road is best illustrated by the fact that last year 272,937 motor cars passed along it, through Dordrecht.

It is not to be wondered at that a place where such a great number of waterways converge plays an important role in inland navigation. This is clearly demonstrated by the large number of steam tugs stationed at Dordrecht, viz., 345 during the past year, with an aggregate power of about 9000 h.p.

This large fleet is partly accounted for by the fact that Dordrecht is the point where a change of tugs takes place on the journey from Antwerp to Germany and back. The so-called salt-water tugs, having surface condensation, tow the barges from Antwerp to Dordrecht, where they are taken over by special Rhine tugs, which take them to their destination.

Besides these towage services there are also numerous inland shipping lines maintained by regular river vessels, while the town further carries on a highly developed carrying trade. Regular river vessels call there about 550 times weekly and during the past year the tonnage of these vessels amounted to 1,768,000 tons in all.

Tramp vessels chiefly carry coal for export and for local use; basalt for hydraulic works along the banks of the South Holland streams; kali for export and for use in the surrounding district; building materials, sand-lime bricks and limestone from the Liege district; sulphates for export chiefly to the Baltic ports, manufactured iron, etc.

The great manufacturing industries established at Dordrecht and in the neighbourhood play an important part in the inland navigation. The raw materials imported by sea-going vessels are chiefly transported by river vessels, after being worked up in the factories.

The principal of these factories are:—

The creosoting works of the Dutch Railways, where railway sleepers are creosoted. These sleepers are chiefly imported from Finland, Russia (Archangel), the Baltic ports, Danzig, and Yugo-Slavia.

The Jurgens Oil Mills and the United Chemical Works at Zwyndrecht, importing oils and sulphates respectively.

The world-famous Safe and Lock Works of Messrs. Lips.

The Creosoting Establishments of Messrs. Gips; and numerous others, all contributing to the prosperity of sea and river navigation.

It goes without saying that for the important inland shipping trade adequate accommodation had to be provided, which is found in the inner harbours and along the river-side. The principal of the inner harbours are the old Sea Harbour, the Kalk Harbour, with a depth of 6.5 metres, where small sea-going vessels are frequently berthed as well, the Riedyk Harbour and Wolwevers Harbour, both chiefly used for tugs, but also for the discharge of goods destined for the important trading firms established there. Further, the newly constructed Merwede Dock and the Railway Dock should be mentioned, both connected with the railway system; the Bom Harbour where many inland vessels call; the New Harbour, the Voorstraat Harbour, and others. The 13 inner harbours of Dordrecht together possess a water frontage of 7000-metres, and cover an area of about 261,500 square metres.

The principal mooring-places along the river are the Handelssteiger, the Buiten Kalk Harbour, the Hooikade, the Groothoofd, and the Merwedekade, with a total length of about 1,600-metres.

These figures also show the importance of the Dordrecht inland shipping trade.

In conclusion a few remarks should be made respecting the policy adopted by the Dordrecht Municipality with regard to its docks and harbours. It may be shortly stated to be as follows:—

The Corporation takes the view that the port charges, the rates for transhipment, etc., should be as low as possible, in order to reduce the general expenses in port to the lowest minimum. Consequently only the great indirect benefits are aimed at resulting from a busy shipping traffic, while direct profits are not the chief object. Further, the Municipality holds the view that the docks should be equipped with the most modern installations for loading and unloading, in order to give steamers the quickest possible despatch, the time thus saved producing a great saving in expenditure. The same principle guides the Corporation in leasing sites for industrial and trading purposes, the greatest possible facilities being granted for such purposes. If the Municipality adheres to this policy, which is undoubtedly the only right one, there is no doubt but Dordrecht has a very prosperous future before it.

PERSONAL ANNOUNCEMENT.

Mr. Herbert Chatley, D.Sc. (Engineering), M.Inst.C.E., has been appointed Engineer-in-Chief to the Whangpoo Conservancy Board (Shanghai) *vice* Captain H. V. Hoidonstam, M.Inst.C.E., who has resigned.

Liner Dues at Cobh (Queenstown).

Proposed Increase by 100 per cent.

Several sittings of the Rates Advisory Committee have been held in Cork to consider the application of the Cork Harbour Commissioners for an order under the Harbours, Docks and Piers (Temporary Increase of Charges) Act for power to make certain alterations in the rates specified in the existing schedule of goods dues and also to increase by 100 per cent. dues payable on liners entering the port.

On behalf of the Commissioners, Mr. J. A. Rearden, K.C., stated that the tonnage payable on liners using the port did not amount to one half-penny per registered ton; as a vessel calling on the outward journey was liable to pay a penny, but recalling on the homeward journey was entitled to use the port free. A great number of Trans-Atlantic liners using the port did so at a charge of one half-penny on the outward and homeward trips. There was no such low charge in any other port in the world.

At Belfast, said counsel, the liners charge was 6d. per net registered ton; in Dublin, 5½d. per ton; in Derry, ½d. per net registered ton. In Southampton, liner companies had to pay 2s. 9d. per head for each passenger embarked and 3s. 6d. for each passenger disembarked, in addition to 1½d. per ton.

The revenue derived by liner companies from Queenstown was not far short of a million pounds per annum. Their contribution for the facilities afforded for so many years was the niggardly sum of £4,000. As a matter of fact, the average loss on the working of the lower harbour, used extensively by liners, was £5,000. If Cork Harbour Commissioners were entitled to similar harbour charges as Southampton in regard to the embarkation of passengers, it would amount to £3,872, while in regard to disembarkation they would be entitled to £2,326.

Sir James Long, Secretary and Manager, Cork Harbour Board, said that no excessive staff was employed, but agreed that greater supervision and control were necessary.

Mr. James Price, Harbour Engineer, gave evidence of the need for improvements in the lower harbour for the convenience of liners.

Replying to Mr. E. FitzGibbon, K.C., on behalf of the liner companies, Mr. Price said that the Tivoli scheme, merely as a dumping ground saved going to sea with the stuff. There was no bank being formed at Dunkettle which would endanger shipping. Captains did not know much about the river when they suggested such a thing. At present, 18-ft. ships were being brought up a channel nominally 16-ft. deep.

The inquiry was adjourned until October, when the shipping companies will present their case against the proposal.

Port Improvements at La Rochelle, La Pallice.

The Major Part of the Work has been Completed, but the Landing Mole remains to be Constructed.

According to the Journee Industrielle of 8th August, the major part of the work commenced five years ago has been terminated, but there remains the construction of the landing-mole off the outer port.

The mole, which is intended for the use of vessels which put in at the port, particularly large liners, will have at the first stage a draught of 10-metres, and vessels will be able to come alongside with ease and security at any time or tide. The work will include the mole properly so-called, a connecting viaduct, railway lines and roadways, superstructure and plant. The mole will have a double front, each with a length of 300-metres. These fronts will be formed of massive masonry pieces 15-metres apart, which will support a platform 45-metres wide made of metallic framework covered with concrete. The depth of the water will be 10-metres 50. In the future the mole may be extended up to 900-metres and the depth at the quayside to 12-metres 50.

The viaduct connecting the mole will be 1,100-metres in length. Two roadways will lead to the mole and the viaduct, one of which will connect with the county road to La Rochelle and the other with the present port of La Pallice.

A hangar will be constructed on the mole. The ground floor and the first floor will be reserved for goods and the upper floor for passengers.

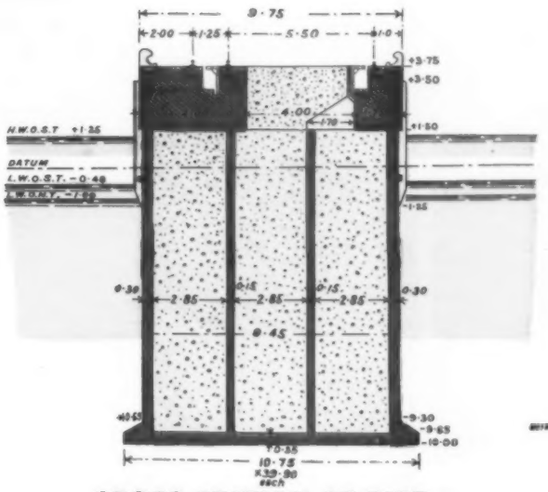
It is estimated that the mole, excluding plant, will cost about 100 million francs, and that it will take about eight years to complete. Reparation deliveries under the Dawes Scheme will be utilised for the work, namely metal joists for the viaduct, framework covered with reinforced concrete, caissons for foundations, cement and concrete for masonry work and an important part of the plant.

PORT OF DORDRECHT.

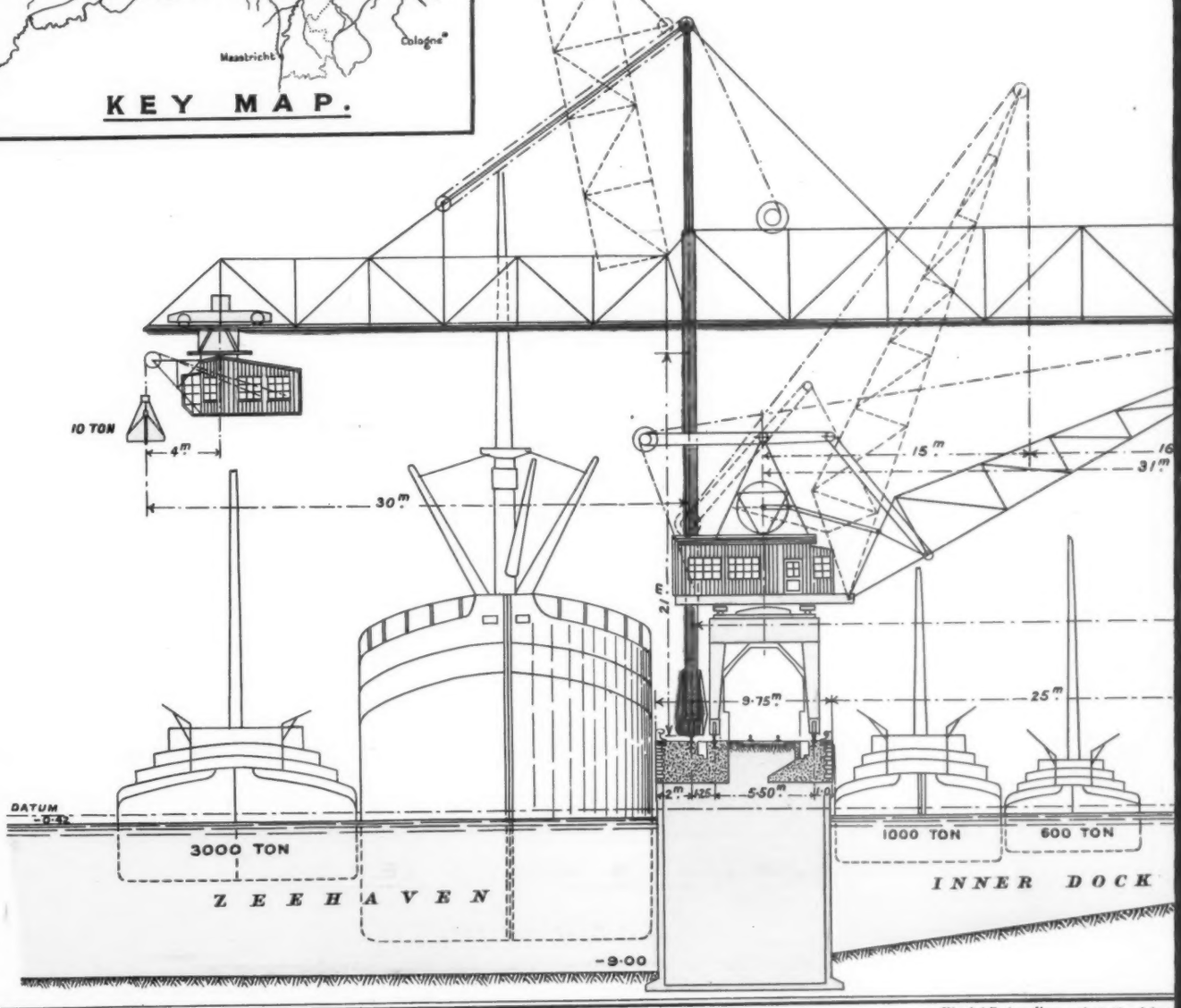
NEW PIER ALONGSIDE THE WESTERN QUAY OF THE ZEEHAVEN.

UNDER THE JURISDICTION OF THE MUNICIPALITY OF DORDRECHT.

KEY MAP.



CROSS SECTION OF PIER.



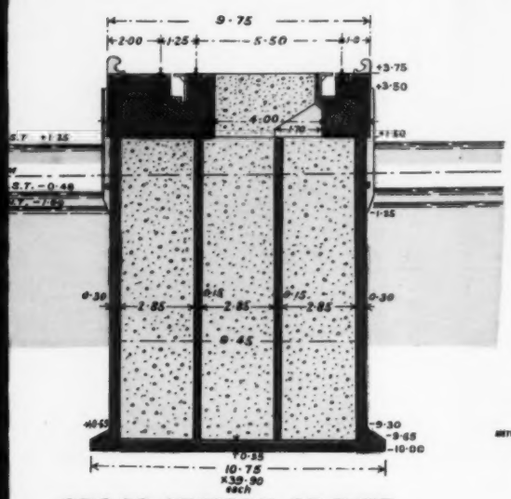
Ward & Foxlow. Harcourt St Marylebone

D THE DOCK AND HARBOUR AUTHORITY

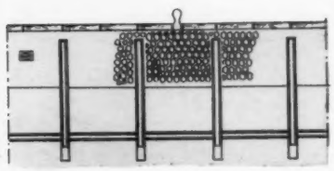
RDRECHT.

QUAY OF THE ZEEHAVEN.

ICIPALITY OF DORDRECHT.



CROSS SECTION OF PIER.



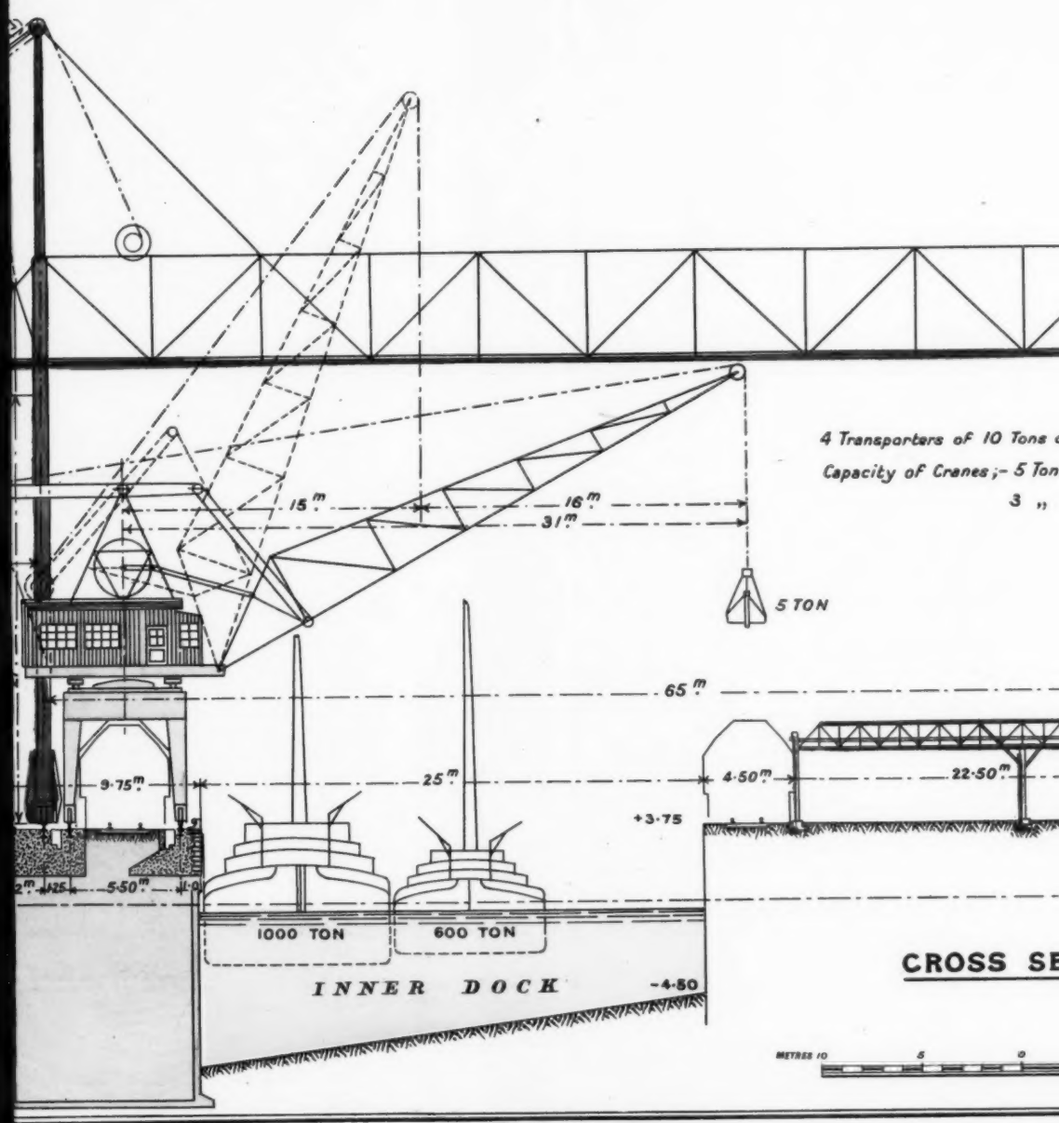
SIDE VIEW OF PIER.

Scale for Cross Section of Pier.

METRES 1 0 1 2 3 4 5 6 7 8 9 10 METRES

NOTE:

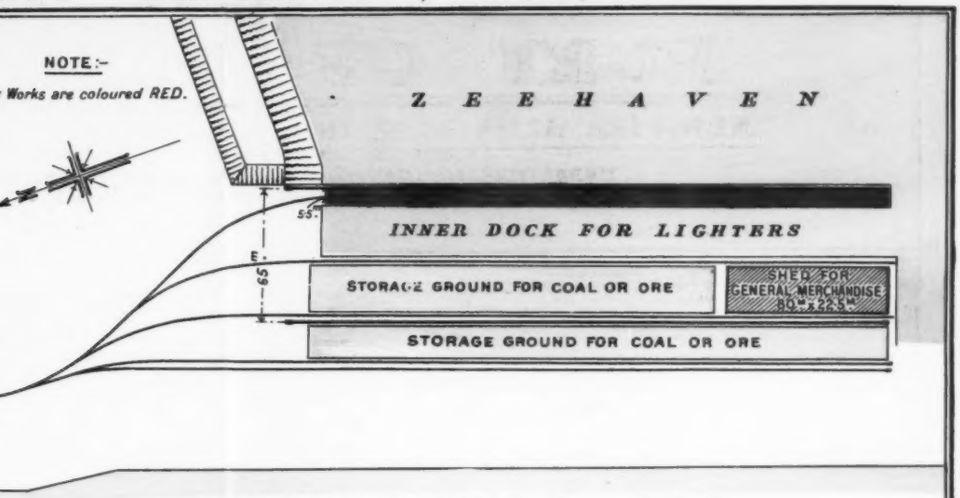
New Works are col



CROSS SE

Ward & Foxlow. Harcourt St Marylebone, W.1. 5186.

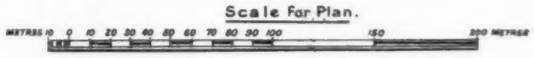
NOTE:-
Works are coloured RED.



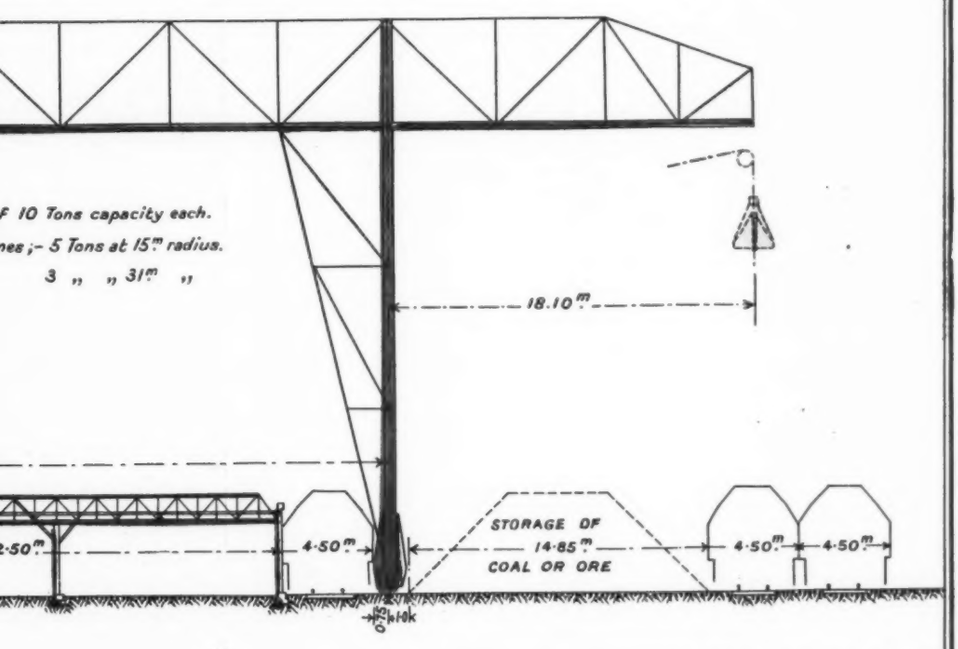
THE MALLE GAT

PLAN SHEWING NEW PIER.

Scale for Plan.

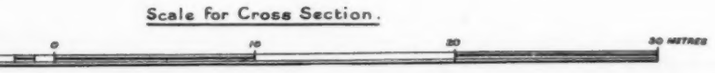


NOTE :- Dordrecht is situated 46 Kilometres from the Sea at the junction of the Merwede, the Noord, the Old Meuse & the Kil. The existing minimum depth of water in the approach channels is 6·5 m which will be increased to 8·5 m in 1929. The other harbours at Dordrecht are as follows :- Kalk Harbour, Riedyk Harbour, Wolwevers Harbour, Merwede Dock, Railway Dock, Bom Harbour, New Harbour & Voorstraat Harbour.

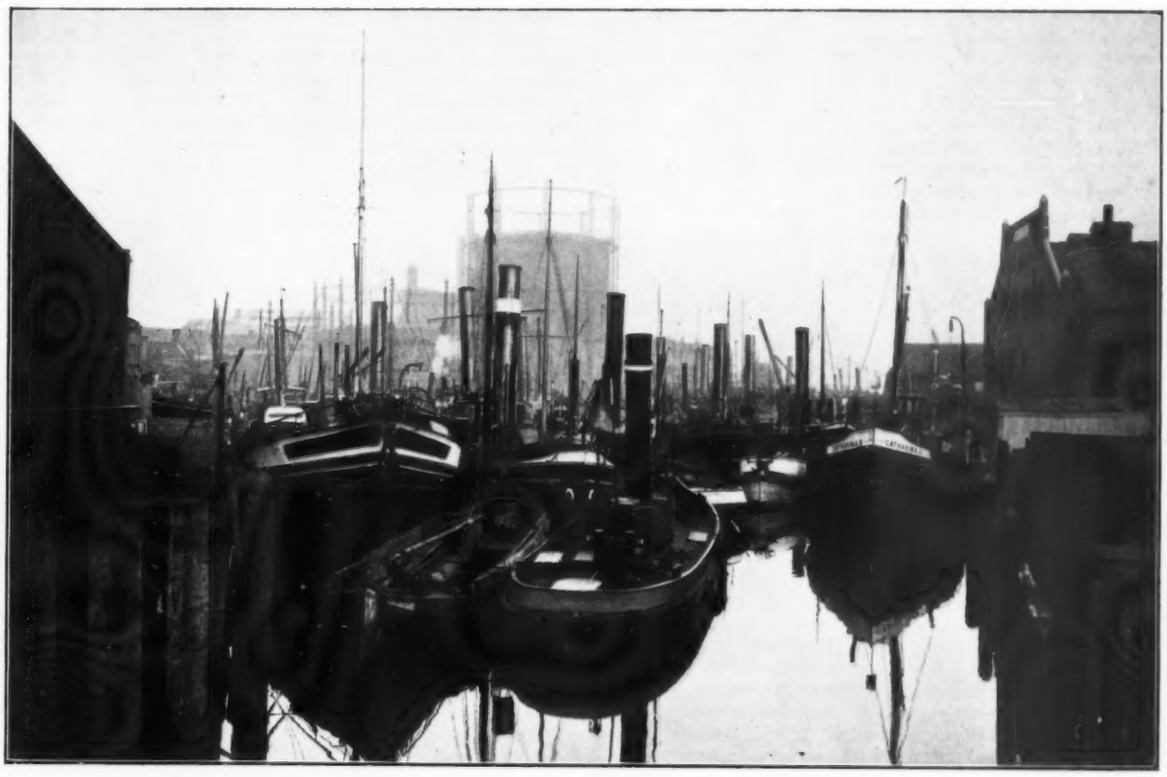


SS SECTION THROUGH PIER ETC

Scale for Cross Section.



Port of Dordrecht.



Tugboat Harbour.

Old Harbour, for the use of small Sea-going Steamers.

Port of Southampton Topics.

NEW QUAY WALL.

The last contract of any importance to be let in connection with the first part of £13,000,000 dock extension scheme at Southampton has been secured by Sir Robert MacAlpine and Sons, of 50, Pall Mall, London. The contract provides for the erection of 3,800-ft. of deep water quay wall on the Western Shore. Fronting this quay, which will accommodate the world's largest liners, will be 45-ft. of water at L.W.O.S.T. and 58-ft. at H.W.O.S.T. The dock wall itself will be the deepest in the world and in its construction 600,000 tons of gravel, 90,000 tons of cement and 3,100 tons of steel will be used. The quay wall will form the southern boundary of the land to be reclaimed and will run practically parallel to the River Test, at a distance of about half-a-mile from Southampton West Station. The width will be 45-ft., and the depth, from coping level to toe, 94-ft. It will be formed by 78 concrete monoliths sunk side by side through a bank which is being constructed partly for that purpose and partly as a reclamation bank. The work of building the wall and of reclaiming the land behind it will proceed simultaneously. The monoliths will each be 45-ft. square on plan and will have nine open wells of about 10-ft. square formed by internal partition walls 3-ft. 6-in. thick. The lower edges will be provided with heavy steel shoes, also 45-ft. square on plan, and 5-ft. 6-in. high. These shoes will be constructed of steel plating, rivetted to steel angle framing so that under the external and partition walls of the monoliths they will form V-shaped troughs terminating in heavy steel cutting edges. The function of these edges will be to cleave their way into the ground as the monoliths are being sunk.

THE METHOD OF CONSTRUCTION.

The operation of sinking the monoliths will begin with the erection, on the site, of the steel shoe which will then be filled with concrete. Powerful cranes will operate grabs to excavate the spoil from the nine wells and the monolith, in consequence, will be caused to sink slowly. As the sinking progresses, successive courses of pre-cast concrete blocks each, weighing on an average 5 tons, bound together, and bedded and joined in cement, will be built up until the cutting edge has reached the desired depth. Several thousand tons of large cast-iron blocks will be on hand to assist temporarily the sinking, should the friction between the sides of the monolith and the ground prove sufficient to prevent the monolith sinking under its own weight. Each monolith will weigh about 7,000 tons and the necessity of guiding these huge structures during sinking and ensuring that they are maintained vertical is, of course, obvious. This will be ensured by grabbing in the wells, to a large extent. For example, if one side tends to sink faster than another grabbing will cease in the wells on the lower side and will be concentrated on the wells on the higher side until the monolith has been restored to a vertical position. When that has been achieved grabbing in all wells uniformly will be resumed. After the monolith has been sunk to its final depth, the bottoms of the nine wells will be sealed with mass concrete, as also will be the three back wells. The six front wells in each monolith will, however, be left unfilled in order to relieve the pressure on the toe of the wall and to concentrate it on the heel for the purpose of stability. The line of monoliths forming the quay wall will then be covered with a concrete deck, which with filling above it will constitute the finished quay. As soon after the completion of the quay as possible cargo and passenger sheds, railways and electric light and water services will be provided, and it is hoped to have a portion of quay, 1,000-ft. long, ready to accommodate ships in two years time.

BUYERS WANTED.

Rumours of the transference of the ships owned by the United States Shipping Board to private enterprise have continually gained circulation in Southampton, and of recent years their frequency has resulted in their being more a matter for smiles than for concern. Now, however, Mr. Edward A. Kelly, vice-president of the American Merchant Fleet Corporation, has announced that the Board are earnestly setting about the business of disposing of some of their ships. Naturally Southampton is interested. The vessels of the United States Line, which trade regularly between Southampton and New York, have in recent years paid their way and have carried a very fair proportion of trans-Atlantic passengers. The line is indeed regarded as being in such a position as would ensure its being successfully run by private enterprise. The s.s. Leviathan, it is pointed out, has carried more passengers this year than any other liner on the Atlantic. The taking over of the vessels, however, does not seem likely to be readily embraced, for a clause in the Merchant Marine Act of 1920 stipulates that the services are to be guaranteed and developed. Compliance with that clause will not be simple, for no guarantees are forthcoming of patronage by the travelling public! Replacements and additions to the fleet will also have to be effected in the not distant future. Mr. Kelly assured me that no change was contemplated in the European ports of call used by the Line's vessels. Southampton, he said, suited them quite well.

WHERE SPEED IS DANGEROUS.

Complaints are often made at Cowes, Isle of Wight, of the danger constituted by the big liners passing through Cowes roads to Southampton at an excessive speed. At the last meeting of the Cowes Harbour Board the Harbour Master reported that at two hours after high water the Cunard liner Mauretania passed through the Roads at such a high speed that a heavy wash was thrown on the esplanade and reached right across into the High-street. Had it occurred nearer high water the consequences might have been serious. The Board decided to complain to the Company concerned, asking that the captain of the vessel should be asked to reduce his speed when passing Cowes.

RECORD HALF-YEAR.

According to the official organ of the Southern Railway Company, Southampton Dock statistics for the first half of the present year show uninterrupted progress. The port's share in the world's commerce has in all directions exceeded that of the corresponding period in 1927, notably in the matter of exports, which show an increase of 8 per cent. The forecast made in the early part of the year that this year's passenger season would be a heavy one has been realised. The number of passengers has far exceeded any previous record, particularly those to and from North America.

Irish Harbour Matters.

DUBLIN HARBOUR.

The reduction in foreign shipping is largely due to the fact that last year's tonnage included many foreign coal vessels.

Bullock Harbour, Dalkey, is to be cleaned and the slipway reconstructed by the Dublin Port and Docks Board, at a cost of £500.

To replace the Tearaght on the Irish Lights Service, the Dublin Dockyard Coy. have built the Isolda, at North Wall. Her engines were fitted in Glasgow by Messrs. Beardmore.

The Tailte, a new 30-foot motor cruiser, built for Mr. W. Freeman, was launched from Mahony's yard at Kingstown, in the early part of July.

EXTENSION OF DUBLIN DOCKYARD SLIP.

The Dublin Port and Docks Board, acting on the report of Mr. Mallagh, Engineer, and Captain Webb, Harbour Master, has approved an extension by 150 feet of the Dublin Dockyard Company's slip, estimating cost at £3,500.

SIX MONTHS' TONNAGE AT DUBLIN.

The return of registered tonnage entering the Port of Dublin for the half year ended 30th June, 1928, is as follows:—

Foreign—25,181 tons, a decrease of 3,783 tons on the corresponding period last year.

Cross-Channel—796,748 tons, an increase of 34,524 over the corresponding period of last year.

There was thus a net increase of 30,741 tons.

SHIPPING ORDER FOR BELFAST.

The African Steamship Coy., Ltd., have placed an order with Messrs. Harland and Wolff, Ltd., Belfast, for the construction of a motor passenger liner for the West African express service. This vessel will be similar to the Apapa, but will have all the latest improvements. The Apapa was launched in August 1926, and is a luxuriously equipped liner of 9,333 tons gross. She is 468-ft. long, 62-ft. beam and 35-ft. deep.

PROPOSED DRY DOCK FOR CORK.

A sub-committee in consultation with the engineer is considering Sir John Scott's proposal to convert the Cork Harbour Commissioners' patent slip into a dry dock. The dry dock would be constructed to accommodate vessels up to 800 tons burden and would be suitable for ships requiring small repairs, inspection of propellers or cleaning up. This, it is suggested, would supply a long felt want, as owing to extra cost, such craft cannot go into large docks in the harbour.

TONNAGE AT LONDONDERRY.

During the month of June there arrived at the Port of Derry, 122 vessels including seven trans-Atlantic passenger steamers with a tonnage of 103,340, as against 95 vessels with a tonnage of 88,863 in June 1927.

QUEENSTOWN TUG FOR CANADA.

The steel twin screw tug, Dainty of Haulbowline, has been leased by the Irish Free State Government to the Canadian Government Railways and Canals Dept. for a period of four months. This vessel has a displacement of 468 tons, is 141-ft. long and 29-ft. broad with a draught of 16-ft. It will be engaged in Hudson Bay until the Bay is closed by ice. For a year the Dainty was used by the Coast Defence Forces of the Irish Free State, but since 1924 has been out of commission. This was part of the Haulbowline equipment handed over to Irish Free State by the British authorities in 1921.

The Port of New Orleans.

A NEW PRIVATELY OWNED SHIPSIDE WAREHOUSE ESTABLISHED IN CONNECTION WITH THE NEW ORLEANS PUBLIC WHARVES.

Another shipside warehouse for the Port of New Orleans—100 000 sq. ft. of storage and merchandising space to be operated in direct connection with the public wharves—was assured on August 9th, 1928, when the Board of Commissioners of the Port of New Orleans granted permission to the Independent Warehouse Company, Incorporated, to construct a runway connecting the company's leased warehouse properties with the Press Street Wharf. This is the fourth shipside warehouse to be established by private interests at New Orleans within the past two years, but while the other three practically limit their operations to the handling of cotton, the Independent Warehouse will handle various commodities, so that any merchandise passing through the port in foreign or domestic trade may receive shipside warehouse services to whatever extent it may require.

The establishment of this plant, according to officials of the Dock Board, offers opportunity for great savings to shippers and consignees, through the elimination ot drayage, trucking and rail switching costs. Such shipside storage, it is pointed out, not only eliminates these expensive movements, but it enables merchandise to be transferred in one handling operation from ship into storage, or from storage to ship, with greater speed and with practically no risk of breakage, leakage or theft. The public wharves of New Orleans are not used for storage, but only for the assembling of cargo within a limited period of time, and the Dock Board has not engaged generally in the warehousing of any commodities other than cotton. Demand for shipside storage of other commodities is a comparatively recent development at New Orleans, and the Dock Board, according to its officials, has not entered into such operations because of the belief that private initiative would meet the demand.

The properties of the Independent Warehouse Company are leased from the Southern Railway, and consist of eight storage compartments, built of brick and concrete, with concrete floors and slate roofs, amply provided with fire protection services and equipment, and enjoying an extremely low insurance rate. They are located in the square bounded by St. Ferdinand, Chartres, and Press Streets, and the riverfront, and are served by excellent roadways and by tracks of the Southern Railway and of the New Orleans Public Belt Railroad. On the front of the warehouse property are four parallel tracks of the Southern Railway, so that in respect to switching services the facilities are unexcelled. The company, of which G. L. Sheen is president, is a New Orleans enterprise.

On the river side, the buildings abut the slope of the levee for a distance of 177-ft. and the runway, to be built under plans approved by the Dock Board's engineer and under his supervision will be constructed at the corner where St. Ferdinand Street joins the marginal road in rear of the Press Street Wharf. This wharf is owned by the Dock Board, and is 806-ft. long, with a 52-ft. shed for its full length and a 38-ft. front apron accommodating two railroad tracks. There is depth alongside for the deepest steamships entering the port, and the wharf is well located for the interchange of merchandise with ocean vessels, river barges and rail lines. Its total area is 75,004 sq. ft., of which 42,216 is shedded, 29,494 devoted to front apron area and, 3,294 to rear apron.

With completion of the runway, which is to be begun at once, there will be six large shipside warehouses in operation in connection with the New Orleans public wharves—two public owned and four private-owned. The five shipside storage plants now in operation may be described as follows:

The public cotton warehouse, with 1,434,790 sq. ft. of covered area, owned by the Port Commission, and reaching shipside through its own 2-storey wharf structure, handles cotton primarily, though other merchandise has been accommodated there as port needs demanded.

The U.S. Army Supply Base No. 1, leased by the Port Commission from the Government, is sub-leased for distribution, storage, merchandising and manufacturing purposes. This warehouse connects by covered ramps with the Poland Street Wharf which is owned by the Port Commission. It has 504,000-ft. of covered space, all occupied by tenants of the Board and used exclusively for their merchandise, materials and equipment.

The Alabo Warehouse Company, with 400,000 sq. ft. of covered space, connected by covered inclines with the Dock Board's Charbonnet Street Wharf, is in theory a warehouse for general commodities, but actually its full capacity is required for storage and merchandising of cotton arriving by barge line from Arkansas and Oklahoma—the purpose for which it is operated.

The Stuyvesant Compress Company, with 300,000 sq. ft. of storage space leased at the Illinois Central Wharves, handles cotton exclusively. These wharves, the property of the Illinois Central, are operated as public wharves by contract with the Dock Board.

The Westwego Compress, with 235,000 sq. ft. of sheds leased from the Texas Pacific-Missouri Pacific Terminal Railroad, also handles cotton exclusively, and its wharves, likewise, are operated as public wharves by agreement with the Dock Board.

The Independent Warehouse, therefore, will be a distinct departure in the commerce of the port, as it will be the first privately-owned storage plant to offer general shipside storage facilities with one handling charge.

BOOKLET ON EXPORT GRAIN RATES.

The Board of Commissioners of the Port of New Orleans has just published a 32-page booklet describing the rate adjusment on grain and grain products from Kansas, Oklahoma and Texas to the port of New Orleans, with a complete index of points of origin. Railroad maps of Kansas, Oklahoma and North Texas illustrate the differentials and photographs show the grain handling facilities at New Orleans. Copies may be had on request.

PORT OF NEW ORLEANS.

The Board of Commissioners of the Port of New Orleans announces that from July 1st, 1928, Mr. William Allen is appointed Assistant to the General Manager in the Foreign Trade Department.

NEW ORLEANS COTTON WAREHOUSES.

A survey of the cotton handling facilities of the port of New Orleans shows that there are now four waterfront warehouses operating over the public wharves direct to shipside, five large warehouse companies which reach shipside by paved roadways or rail terminal tracks, and five railroads maintaining cotton storage space in rear of wharves or at shipside. The combined storage capacity is in excess of one million bales. Approximately 75 per cent. of the cotton received at these plants is destined for water shipment, and of total cotton exports through New Orleans. The storage facilities for cotton at New Orleans are as follows, with capacity in high density bales.

	Bales Storage Capacity.
At Public Wharves:—	
New Orleans Public Cotton Warehouse... ...	461,856
Alabo Compress Company	75,000
Westwego Compress Company	50,000
Stuyvesant Compress Company	55,000
Back of Waterfront:—	
Commercial Press and Warehouse Co. (2 yards)	52,000
New Orleans Compress Co.	75,000
Terrell Compress and Warehouse Co. (4 yards)	69,933
Federal Compress and Warehouse Co.	60,000
Union Compress Company	13,000
Railroad Cotton Warehouses:—	
Southern Railway System (at Chalmette Slip, Press St. and Basin)	105,198
Southern Pacific Railroad	8,000
Louisiana Railway and Navigation Co.	1,600
Illinois Central Railroad (Warehouse 32) ...	20,000
Texas Pacific-Missouri Pacific (Orleans and Brogan Presses)	12,500
Total cotton warehouse storage	1,059,087

Six of the larger plants, including the public cotton warehouse, operate as government bonded warehouses, and issue government negotiable receipts. Six high density presses are operated in the waterfront warehouses, and seven of the same character in the other yards. Expert services of every kind are performed in any of the plants—weighing, sampling, marking, tagging, storing, compressing, patching, delivery as ordered to shipside, railroad, or drays etc., all under published tariffs. They are generally equipped with the most modern and most economical of mechanical handling devices, and of fireproof construction.

The public cotton warehouse, said be to the largest cotton warehouse in the world, was built at a cost of $6,183,000, and has an area of 62 acres for present plant and expansion. The present physical developments for storage and merchandising services occupy 48 acres of ground area, and covered floor areas amount to 1,434,790 square feet, or nearly 33 acres. Its five great storage units communicate directly with the 2-storey cotton-wharfhouse, which is one of the finest shipside structures in the country. Belonging to the Board of Commissioners of the Port of New Orleans, an agency of the State of Louisiana, it is the greatest commercial warehouse in America under public ownership and operation. The immensity of its operations are indicated in the fact that in the busy season this plant issues daily as many as 8,000 single-bale negotiable warehouse receipts, and that in an average season it handles 600,000 individual packages of merchandise (cotton), with individual record for each, of ownership, weight, marks, etc.

The Alabo Compress Company was established to handle barge-line cotton, and its traffic is almost exclusively of that character. The warehouse is connected by ramps and conveyor system with the Charbonnet Street Wharf of the dock board, which is under preferential assignment to the Inland Waterways Corporation. It actually handles upwards of 200,000 bales of barge-line cotton per annum.

The Westwego and Stuyvesant Compresses are operated under agreement with the dock board over wharves owned by the Illinois Central Railroad, and Texas Pacific-Missouri Terminal Railroad. By the contract with the dock board these are public wharves, but the preferential right to their use is granted to vessels handling the traffic of the respective compress companies which have their storage in rear of the wharf-aprons.

These four waterfront cotton warehouses have a combined storage capacity of 641,856 bales, and equipment of six high density compresses, plus every facility for expeditious handling —motor trucks, tractor-trailers, conveyor systems, electric cranes, etc. The private warehouses which do not connect with shipside are variously situated, but all conveniently for prompt movement by rail sidings or drays to any part of the waterfront.

MOVEMENT OF ALUMINIUM ORE.

The quantity of import aluminium ore handled through the New Orleans bulk commodity handling plant in July, 1928, was greater than that for any month since January, amounting to 39,081 tons, whereas the record for January had been 40,006 tons.

PUBLIC GRAIN ELEVATOR ACTIVITY IN JULY.

The New Orleans public grain elevator in July, 1928, received 230,512 bushels of corn, wheat, oats and rye, of which 97,489 were by rail and 133,023 by barges. Deliveries were 262,909 bushels, of which 138,935 were corn and 119,519 wheat. On hand at the close of business, July 31st, were 237,293 bushels.

INNER-HARBOUR NAVIGATION CANAL.

There were 835 vessels of 365,795 tons which used the New Orleans inner harbour-navigation canal in the month of July, 1928, according to the superintendent's report to the Dock Board. This is an increase of 44 vessels and of 63,731 tons as compared with July, 1927.

The northbound movement consisted of 66 Mississippi-Warrior vessels of 28,556 tons, an increase of 17 vessels and of 6,368 tons; 27 steamships of 108,872 tons, an increase of 10 vessels and of 190,083 tons; 327 other vessels of 50,295 tons, a decrease of 2 vessels and an increase of 12,100 tons; total, 420 vessels of 187,723 tons, and a total increase of 25 vessels and of 37,551 tons.

The southbound movement consisted of 58 Mississippi-Warrior vessels of 24,376 tons, an increase of 6 vessels and decrease of 1,020 tons; 27 steamships of 112,578 tons, an increase of 9 vessels and of 19,860 tons; 330 other vessels of 41,118 tons, an increase of 4 vessels and of 7,340 tons; total, 415 vessels of 178,072 tons, an increase of 19 vessels and of 26,180 tons.

NEW ORLEANS SHIPPING IN JULY.

New Orleans shipping for the month of July, 1928, maintained the record of steady increase which has been apparent throughout the year, according to the accounts of the Board of Commissioners of the Port of New Orleans. There were 251 arrivals of deep-sea vessels with gross tonnage of 937,729, of which 754,642 tons used the public wharves. There were 241 departures in deep-sea trade, or 10 more than July of 1927.

Arrivals of inland water craft of over 25 tons by the Mississippi River were 227 steamboats, oil motor vessels and barges, of 93,641 tons. These were 71 Mississippi-Warrior barges of 47,663 tons and 20 Mississippi-Warrior tugs of 17,402 tons, 55 other barges of 17,274 tons, and 81 steamboats and oil motor vessels. As compared with the same month of the previous year, there was an increase of 22 barges and of 14,504 register tons in their aggregate measurements.

The Dock Board's banana conveyors handled 1,913,668 stems of bananas, an increase of 8,258 over the same month of 1927.

Deep-sea arrivals for the month, by nationality, were as follows:—

Flag.	No. of Vessels.	Gross Tonnage.
American	124	528,468
British	19	87,958
Brazilian	2	9,112
Belgian	1	4,974
Danish	6	15,255
Dutch	5	28,148
French	4	27,894
German	4	17,373
Honduran	28	62,643
Italian	5	28,627
Japanese	2	16,749
Nicaraguan	5	7,027
Norwegian	40	83,733
Panaman	2	1,336
Swedish	4	18,432
Total	251	937,729

NEW ORLEANS AIR LINE TO THE GULF EXPANDS TERMINAL FACILITIES.

The New Orleans Air Line, which for seven and a half years has furnished regular daily airplane service between the port of New Orleans and vessels arriving or departing in the South American and Central American trades, has just completed a new hangar, 60 by 80 feet, on the waterfrontage which it rents from the New Orleans dock board at the junction of the Mississippi River and the inner harbour navigation canal. This new construction was rendered necessary by increased use of the service and consequent greater demands on the flying equipment. The air line company now has two hangars and two runways at its New Orleans terminus, a runway at Pilot Town, and plans for constructing a fourth at Port Eads.

The new structure was built large enough to take care of reserve equipment and to afford workshop space for the construction of wings and hulls, all of which are to be built by the company on its own premises. The old hangar will be used principally for storing planes. The company has ten Curtiss seagulls, five of which are kept constantly ready for flight, and two of which are used in daily trips.

This is the second oldest air-mail in the United States, having been established in February, 1921, shortly after the inauguration of the government trans-continental line. Its operation from New Orleans to Port Eads has resulted in a tremendous saving to steamships in the South and Central American trades, and in a much greater economic saving to commerce through the expediting of mails. The line has a carrying contract with the U.S. Fost Office Department, and mail inbound to New Orleans is advanced as much as 12 to 14 hours by the service, or as much as 24 to 36 hours in case of mail for points beyond New Orleans. On outbound steamers the mail is frequently advanced as much as five or seven days. The great saving to shipping results from the fact that a vessel may sail as soon as she completes her cargo, leaving unfinished clearance papers and all ship's documents to follow by airmail a few hours later. The airplanes with mail make the trip from New Orleans to Port Eads in about an hour and a half and the mail is delivered by pilot boat. Inbound mail receives similar service, including crew lists, passenger lists, stowage plans, or any other ship's documents, so that the official delays in connection with such papers are practically eliminated. Later mail, up to 1.30 p.m. is assembled for the air line, which sends its plane out at 2 p.m.

The planes carry from 900 to 1000 pounds of mail each trip—from thirty to forty bags. This is a part of the foreign mail service and no extra postage or other charge is made, the expense being borne by the government in full. Ship's papers move thus as ordinary mail, so far as expense is concerned, and the service is of no cost whatever to commerce or to shipping. In case of passengers missing connection with their boat, the planes make a special charge.

In the seven and a half years of operation there have been a few days when weather conditions prevented flying, but, practically, the service has been without interruption, and deliveries have all been made, at either end of the line, without failure or delay. All steamship companies in the South and Central American trades use the opportunity for saving time in their sailing schedules, such as the United Fruit Company, Standard Fruit and Steamship Company, Cuyamel Fruit Company, New Orleans and South American Line, Munson Line, Luckenbach Line, etc. The hangars of the company are used by the U.S. naval planes from the Pensacola base as their New Orleans terminus. The existence of the line also has been of service in various emergencies, as when it became necessary on some occasions to board vessels in the open Gulf.

CONTRACTS FOR CARGO BRIDGES AND PIPING OF POYDRAS STREET WHARF.

The Board of Commissioners of the Port of New Orleans on August 9th, awarded to the Canal Steel Works contract for furnishing, erecting and painting five cargo bridges to serve the second storey of the Poydras Street green coffee wharf, for $7,930. At the same time, contract was awarded to the LaDew-Casey Enginering Company for furnishing and erecting down-spouts, piping and hose racks at that wharf, for $12,917.23. Total, $20,847.23 for the two contracts.

Contracts previously let for work on the Poydras Street shed total $1,314,179, covering foundations, wharf steel, wharf steel erection, steel sheet piling, concrete floor and walls, and creosoted fender piles, all of which is 100 per cent. complete, shed steel erection which is 66 per cent. complete, second floor concrete slab which is 5 per cent. complete, roofing and sheet metal work.

W. LYLE RICHESON APPOINTED PORT COMMISSIONER.

W. Lyle Richeson, export grain broker, real estate operator, and vice-president of the New Orleans Board of Trade, has been appointed by Governor Huey P. Long as a member of the Board of Commissioners of the Port of New Orleans, to fill the vacancy created recently by the resignation of President Rudolf S. Hecht. Mr. Richeson is a former member of the board, serving as an original appointee of Gov. John M. Parker

at the time of reorganization in 1921. His commission was from October 4th, 1921, to July 1st, 1925.

At a regular meeting of the board on August 9th, Commissioner Edw. S. Butler was elected president to succeed Mr. Hecht in that office. Mr. Butler is president of the cotton firm of Weatherford, Crump and Co., a former president of the New Orleans Cotton Exchange, and a member of the port commission since March 18th, 1923.

HEAVY BARGE LINE WHEAT MOVEMENT TO NEW ORLEANS FOR EXPORT.

The movement of wheat by inland waterway barges to New Orleans from mid-west and upper Mississippi territories may amount to several million bushels during the 1928 export season, according to present prospects. W. M. Hough, Traffic Manager for the Barge Line at New Orleans, states that beginning in early September, there will be a movement of over 1,000,000 bushels of wheat by barge from the Minneapolis-St. Paul region of the upper Mississippi. This is practically a new movement, as Barge Line service has only recently been extended to that territory. Regarding movement from the mid-west states of Nebraska, Kansas, Missouri, etc., Mr. Hough will make no estimate, believing, however, that it will be limited only by the capacity of the Barge Line equipment. There are at present 300,000 bushels of wheat actually on barges en route from St. Louis to New Orleans for export, and such shipments will continue through the season, so that the total may amount to several million bushels.

All of this export wheat is handled at New Orleans through the Public Grain Elevators of the Board of Commissioners of the Port of New Orleans, for storage and transhipment into ocean vessels. The grain is discharged from barges by two marine legs, each with capacity of 15,000 bushels an hour—the only equipment of this character on the Gulf of Mexico. The marine legs deliver the grain into the storage bins of the Public Elevators, or can deliver direct into the holds of ocean ships. The Port Commission operate a total grain storage capacity of 5,122,000 bushels, with ten loading berths for steamships, in addition to barge discharging berths and a modern sacking wharf.

TODD WHARF AND REPAIR PLANT COMPLETED.

The Board of Commissioners of the Port of New Orleans announce the completion of the 1,500-ft. wharf, constructed for Todd Engineering, Dry Dock and Repair Company on the right bank of the river, simultaneously with the announcement by the Company that its shop, office building, boiler house and other accessory construction have been completed, and that the plant now awaits the early arrival of the 12,000-ton electrically driven dry dock which will greatly increase the ship repair facilities already existing in New Orleans Harbour. The Todd Company's total outlay on wharf, buildings and equipment has already been approximately $1,000,000.

The wharf, built by the Board from funds advanced by the Todd Company according to the usual contract terms, is 1,500-ft. long and 32-ft. wide, with tracks extending its full length from the U.S. Navy Yard to the Immigration Station Wharf. These tracks acommodate a 15-ton travelling crane, used for efficient and speedy handling of heavy material from ships to the shops. The tracks are of standard gauge and can be connected to trunk lines in case of emergency. The wharf is connected throughout with air lines, 6-in. fire lines and steam lines. Alongside is a minimum depth of 50-ft. at low water, which is approximately the depth needed for docking large steamships. The wharf is of heavy pile and timber construction, some of the piles being over 100-ft. in length.

A pier of similar construction, with rails for the travelling crane, extends from the wharf over levee and roadway to a 10-ton stationary crane which is used for loading and unloading cars for the shop. The shop, in rear of the levee, is of heavy steel construction, 88-ft. by 200-ft. in dimensions, equipped with a 20-ton electric travelling crane, 30-ft. plate rolls, mangle rolls, plate punches, shears, 42-ft. lathe, boring mills, drill presses, shapers, pipe machines, bolt machines, 30-ft. plate furnace, bending slabs, steam hammers, air compressors, and complete pipe shop and blacksmith shop. The entire plant is electrically operated, using power from the public service plant. There are also two boilers for general use.

The office building, of steel construction, has its second floor allocated to general offices and surveyor's rooms, while the ground floor is to be used for the timekeepers and general foremen's offices and light stores.

This new plant is an expansion of the present facilities of the Company which now occupy two city blocks in the City of New Orleans at South Peters and Howard Avenue.

DEATH OF W. B. THOMPSON.

W. B. Thompson, President of the Board of Commissioners of the Port of New Orleans from December, 1916, to September, 1919, and one of the foremost citizens of New Orleans in the work of port development, died from a heart attack on August 11th. It was during Mr. Thompson's incumbency that the New Orleans Inner Harbour-Navigation Canal was built. Four times President of the New Orleans Cotton Exchange, he was then largely responsible for the efforts which resulted in construction of the largest shipside cotton warehouse in the world, owned by the Port Commission. Mr. Thompson also was active in the affairs of the Public Belt Railroad Commission which serves the port facilities, and was for a time president *pro tem* of that body.

RECORD OF THE FIREBOAT "DELUGE."

The fireboat "Deluge," owned by the Board of Commissioners of the Port of New Orleans, and operated by that Board for the protection of shipping and waterfront structures, has answered 213 alarms since November 6th, 1923—the date she went into commission—according to figures compiled by the Board on August 8th for the Fire Prevention Year Book. These calls included cargo fires of almost every kind, in sulphur, cotton, cork, sisal, manila hemp, grain sugar, staves, glucose, mineral oil, coal, etc. Only a few have been really large fires, as the explosion of the "O. T. Waring," which set fire to the Jahncke dry dock; the fire of the s.s. "Bienville" and that of the s.s. "West Ira." But the record shows that the "Deluge" has never answered an alarm without extinguishing the fire, and that she saved the ship on every occasion. In all cases efforts have been made to minimize damage, and by the use of small hose lines, steam lines and foamite, many threatening fires have been extinguished with no water damage at all. The "Deluge" is said to be the largest and most powerful fireboat in the world, capable of pumping 14,000 gallons of water a minute, and with a maximum speed performance of 16½ miles an hour. She can throw 32 streams simultaneously. No charge is ever made for her services.

VANCOUVER PORT DEVELOPMENT.

The Annual Report of the Vancouver Board of Harbour Commissioners for 1927 contains an interesting description of the rise of Vancouver as a grain-shipping port, detailing various developments in the facilities afforded by the harbour since 1921, when 1,500,000 bushels passed out for United Kingdom ports and Japan.

Elevator construction has been proceeding vigorously during the past half-dozen years, as a result of which the port will have a storage capacity of approximately 10,700,000 bushels in readiness for the 1928 crop.

During the year no less than 1,123 deep-sea vessels entered the port, as compared with 1,071 in 1926, with an increase in gross tonnage of 188,779 tons; the total number of vesssels of all classes entering the port was 20,363, or 596 more than in the previous year, and an increase in tonnage of 610,689 tons.

NEW WESTMINSTER PORT DEVELOPMENT.

Construction of the first unit of the Pacific Coast Terminals at New Westminster, B.C., has been begun, the opening ceremony taking place in the presence of the Hon. Dr. J. H. King, M.P., Dominion Minister of Health, and Sir Henry Thornton, President of the Canadian National Railways.

The project includes the provision of a cold storage building four storeys in height, and the extension of the wharf of the Fraser River Dock and Stevedoring Co., Ltd., acquired by the new concern, by 1,000-ft. This will give a total berthing space of more than 3,000-ft.

Another interesting project in connection with the development of New Westminster as an important ocean shipping port on Canada's Pacific coast, is the building of a million-bushel grain elevator by the New Westminster Board of Harbour Commissioners, on which construction has been started. This will be the first elevator on the Fraser River, and ample scope for development of the expected grain traffic is provided on the south side of the river, where 12 acres of land has been reclaimed, the site also including 60 acres on shore. Two ships will be able to berth at the 1,100-ft. wharf, where there will be a 30-ft. depth at low water.

PORT OF MONTREAL.

According to the Annual Report of the Montreal Harbour Commissioners for 1927, just issued, the harbour had last year an exceptionally heavy traffic, an almost complete set of new records having been established.

During the year no less than 11,921,173 tons of commodities passed over the wharves, an increase of no less than 30 per cent. over the 1926 figure, amounting to 9,210,699 tons. The 1927 tonnage is nearly double that of 1921.

Ocean-going vessels using the port numbered 1,610, of a net registered tonnage of 4,992,486 tons, as compared with 1,421 vessels with a tonnage of 4,221,730 tons in 1926.

The total grain exports during the year reached 195,247,914 bushels, as compared with 135,897,882 bushels during the previous year.

The port handled a total of 2,448,477 tons of coal, as compared with the 1926 total, amounting to 1,887,988. It is of interest further to note the growing totals representing imports of British coal, the 1927 tonnage of anthracite having reached 683,090 tons.

Hull and the Humber.

At the July meeting of the Humber Conservancy Board, it was decided to further reduce the shipping dues on the River Humber after July 31st, by 5 per cent., making the dues 30 per cent. below the statutory maxima. The Finance Committee reported that they had reviewed the Board's financial position and that they were informed that the working, on revenue account, showed a surplus of income over expenditure of £8,557. For the year ending May 31st next, it is estimated the surplus will be £7,795. It was decided to accept the invitation of the Chairman and Directors of the Manchester Ship Canal to inspect the canal, and a date towards the end of September was suggested.

A step forward in the direction of increasing the accommodation for the timber import trade at Hull has been taken by the London and North Eastern Railway, whose representatives have intimated that in order to facilitate the movement of laden and empty timber bogies and wagons passing between the south side of the Victoria Dock and the Merchants' Yards, and the despatch of wagons to Priory Yard and Sivet Dews, for forwarding on outward trains from Hull it is intended to construct four additional transfer sidings parallel to the running lines. For this purpose part of No. 1 timber pond is being filled in to so provide the necessary land. The major question of the utilisation of the land known as the Western Reservation lying between the Victoria and Alexander Docks for greatly extended facilities for the timber trade is still in abeyance. The Hull Corporation, who own the land, and the London and North Eastern Railway Company have been brought together, but from what transpired at the meeting on August 2nd, there is still a difference between them as to whether the Company are allowed to purchase the land or to obtain its use only on lease. The Property Committee it appears have passed a resolution to the effect that inasmuch as negotiations can only continue on the basis of the Corporation being disposed to sell, the London and North Eastern Railway should be informed that the Corporation are not disposed to sell. Thus the matter stands at the moment. Councillor Sherwood, a member of the timber trade, moved that the minutes be referred back, as the decision of the Committee rather closed the door to further discussion. He added that he did not think it was in the interests of the city that for 40 years this valuable piece of land had been allowed to stand idle. The while the congestion in the timber trade had become increasingly acute. He did not advocate that it should be sold but should be used to some advantage. Sir Alfred Gelder, however, said that the decision not to sell did not close the door. The Corporation had held the land for 40 years and were prepared to hold it for another 40 years, for it was the only free outlet to the Humber. The whole of the river front for six or seven miles being in the possession of the railway company with the exception of the Corporation Pier. The Corporation were prepared to assist the timber trade because they recognised it as a very valuable industry and they would do everything except sell the land outright. They had offered to let the land to either the timber trade or the railway company on a lease of 21 years, but the railway representatives had turned the offer down. The amendment to send the minutes back was lost and the decision not to sell confirmed.

Mr. George Davidson, Divisional Manager of the L. and N.E.R., who, with other representatives, was at Hull in connection with the visit of the Jam Sahib of Nawanagar (better known to the cricketing world as Prince Ranjitsinhji), expressed gratification with the outlook at Hull and the progress made with the extension of the new fish stage at the St. Andrew's Dock, about 500 feet of which is now practically completed, and with the second or duplicate oil jetty at Saltend, which is nearly ready for use. Mr. Davidson also mentioned that the L. and N.E.R. are proceeding with additional grain silo facilities at King George Dock as soon as the officials' reports have been considered.

The Jam Sahib spent an interesting two days in Hull and was entertained by the Lord Mayor at a banquet at the Guildhall, and by Major A. J. Atkinson, J.P., President of the Hull Chamber of Commerce at luncheon the following day. The visit was undertaken with a view to developing the trading relations between the Port of Hull and the Indian State of Nawanagar, of which His Highness is the ruler. A tour of the docks was made under the guidance of Mr. George Davidson, Divisional Manager, and other officials of the L. and N.E.R., and visits were paid to the leading seed crushing mills and other factories. Hull utilises large quantities of ground nuts for the purposes of extracting the oil and they are one of the principal exports of the state governed by Prince Ranjitsinhji.

The proposal to construct a new pier and landing stage at Hull to accommodate the cross-river traffic between the Yorkshire pool and New Holland on the Lincolnshire bank referred to by the Hull City Council to committee, has been taken up by the Property and Bridges Committee. At a private meeting held a few days ago, a resolution was passed expressing the opinion that it is desirable to provide a scheme on the lines of the 1911 scheme, modified as may be found necessary, with a view to meeting the objections put forward by the river craft interests, who are anxious that nothing should be done to jeopardise the entrance to, and navigation of, the river Hull, which flows into the Humber at a point near the existing Corporation Pier and landing stage. We also understand that it was resolved in the first instance to consult the L. and N.E.R. Company with regard to the suggested scheme, they being the owners of the steamers conducting the ferry service, and a sub-committee was appointed to approach the Company. Ostensibly the object of this is not only to secure agreement upon a suitable scheme, but to invite the L. and N.E.R. to contribute towards the cost as was tentatively agreed upon when the matter was discussed some years ago.

Trials of the Oil Tanker "Caspia."

The Single Screw Oil Tanker Steamer "Caspia," built to the order of The Overseas Oil and Transport Company Limited, by Sir W. G. Armstrong Whitworth and Company Limited, at their Walker Shipyard, carried out her final full power speed trials at sea under fully-loaded conditions on the 8th and 14th August, with highly satisfactory results.

The length of the vessel overall is 427-ft. with a moulded breadth of 53-ft., and she is designed to carry 8,475 tons deadweight on a mean draft of 25-ft., at a speed of 11 knots per hour.

The machinery which is placed in the after end of the vessel, and consists of Direct Acting Surface Condensing Triple Expansion Engines of the most modern and improved design, and steam is supplied by three multitubular boilers at a working pressure of 180 lbs. per square inch.

The boilers are thoroughly equipped for coal burning, and also arranged for burning oil on an improved system.

The vessel, with her machinery, was built to Lloyd's latest rules under special survey for their 100 A.1 Class.

The vessel, under full load conditions, proceeded to sea on the 8th August for trials under oil burning conditions and on the 14th August for coal burning, and both trials were entirely satisfactory.

The Owners' representatives, Mr. F. Gilbert, Captain Reid and Mr. J. A. C. Horton, were highly satisfied with the results of the trial, as the speed obtained was in excess of that guaranteed. The machinery worked throughout without a hitch of any kind.

The Shipbuilders were represented at the trial by Mr. A. Shearer and Mr. J. W. Gibbeson, and the Engineers by Mr. Maller.

Crossing the Channel in Fog.

How Marconi Direction Finder helps Shipping.

The recent remarkably clear weather inland was marked on one occasion by exceptionally heavy fog in the Channel. This is the condition in which the Marconi Direction Finder gives its maximum service to shipping, and a remarkable instance of the usefulness of this navigational instrument has been received in a report from the Master of Messrs. P. & A. Campbell's (Bristol) passenger steamer "Waverley," which had to cross the Channel during this foggy period.

The Master says that during the trip from Hastings to Boulogne the results given by the Marconi wireless direction finder were "absolutely accurate." The ship ran into dense fog in mid-Channel. Wireless bearings were immediately taken and the course of the ship altered as required.

The first thing sighted after the ship entered the fog was Boulogne Buoy, which when first seen was only a few yards on the starboard bow. The ship entered the harbour dead slow with the piles on either side barely visible.

The Master adds that he was sure his journey could not have been accomplished in anything like the same time without the direction finder, as another steamer which followed them in was over an hour late.

Messrs. P. & A. Campbell's cross-Channel passenger steamer "Devonia" is also fitted with the same type of direction finder as the "Waverley," which is also giving very accurate results.

Tenders Invited.

His Majesty's Trade Commissioner at Melbourne (Mr. H. L. Setchell) reports that the Melbourne Harbour Trust Commissioners are inviting tenders for the supply and delivery, complete with full equipment, of:—One Stationary Reclamation and Barge Loading Suction Cutter Dredge. Tenders must reach Melbourne before 11 a.m. on 13th November, 1928. Local representation is essential. Firms in a position to offer a British built vessel can obtain further particulars on application to the Department of Overseas Trade, 35,Old Queen Street, London, S.W.1. (Ref: A.X.6688).

Harbour Structures.

III.—Protection from Marine Organisms.

By WILLIAM G. ATWOOD, Consulting Engineer, New York.

TYPES OF TIMBER.

Timber structures of all kinds should for reasons of economy be protected from attack by organisms causing decay or wood boring animals if above water level or from attack by boring animals if below. This result may be accomplished by the use of timber which is resistent to these attacks or by some method of protection.

Fig. 1. Crustacean Borers.

Heart wood of most species of timber indigenous to the temperate zone resist decay, but except for the long leaf yellow pine and fir of the United States, few of these timbers are available in structural sizes or have sufficient strength to be useful for heavy construction. Many species of tropical timber have a high resistance to decay, but their cost at a distance from their point of origin prevents their economical use. None of these temperate zone timbers will resist the attack of termites or marine borers, and only a few of the tropical timbers will do so.

In the present state of the art it appears that the pines protected by some efficient impregnation process, are the most economical for general use above water level. A proper treatment will protect this timber from both decay and insect attack and since a comparatively low grade timber with proper treatment will outlast heart timber and is as strong, (the U.S. Forest Products Laboratory state that there is practically no difference in the strength of heart and sap wood), the added cost of treatment does not add greatly to the cost of the structure.

Impregnation with creosote has been practical for a century, and this method of treatment has received much scientific study, and has been quite well standardised.

Zinc chloride, sodium fluoride and some of the salts of copper are good preservatives if used under suitable conditions.

The danger of attack by termites has been quite well recognised in the tropics, but at least in the United States they seem to be spreading rapidly to the north, and this is probably true in other parts of the world. Their presence has long been recognised south of a line passing through Washington and St. Louis, but recently they have done serious damage as far north as Vermont.

Because the damages caused by these insects occur above the water level the hazard created by their activities must be considered for that portion of a harbour structure above mean high water.

MARINE BORERS.

Below water level in salt water and to a very limited extent in fresh water, timber is subject to attack by marine borers. In locations favourable to their life, the damage they do is almost unbelievable.

Biologically these boring organisms are divided into two groups, the crustaceans, related to the lobster and crab, and the molluscans, related to the oyster and clam. Both groups are very destructive, the former slightly less so than the latter.

DESTRUCTIVE CRUSTACEANS.

The crustaceans are of three genera, the *limnoria*, *chelura* and *sphaeroma*, of which the first is the most numerous and destructive (Fig. 1).

There are several species of *limnoria*, but the one best known and most widely distributed is the *limnoria lignorum*. The other species differ from it only in detail and a separate description of them seems unnecessary.

The *limnoria lignorum*, frequently known as the "Gribble," was originally recognised in Norway in 1799, and is widely distributed in both the Atlantic and Pacific. It resembles and is related to the ordinary woodlouse.

The body of this animal is from $\frac{1}{8}$-in. to $\frac{1}{4}$-in. in length and about $\frac{1}{3}$ as wide as it is long. It is slipper shaped and has a small head and segmented body, ending in a broad tailplate, which can be tilted to close the burrow against intruders.

The head has a pair of eyes, two pairs of feelers and on the under side four pairs of mouth parts, including a pair of horny tipped mandibles with which most of the boring is done.

There are seven pairs of legs with sharp hooked claws which enable the animal to cling to the wood and move around. The gills are flat membranous plates which furnish the motive power for swimming when the animal is in the water. The animal can curl itself into a ball.

The young when hatched differ only in size from the adults and are ready to begin boring at once. Four hundred of these animals have been counted on a single square inch of timber.

Fig. 2. Typical "Limnoria" attack.

LIMNORIA AND CHELURA.

The *limnoria*, as is the case with the other crustacean borers, attacks the wood by boring shallow burrows in the surface of the wood, and since the animals are so numerous the wood is quickly honeycombed, and the surface falls away, opening a fresh surface of attack. The maximum intensity of attack on a pile generally occurs either at the mud line or in the tidal range, but it may be anywhere between the mud line and a point slightly above high water . A heavy attack generally works a pile down to a point and then cuts it off. (Fig. 2).

Limnoria is highly resistant to toxics and can live in polluted water. So far as records indicate they are not found in

water with a salinity much below 15 parts per 1,000, though they have been found occasionally in a much lower salinity.

The *chelura* has the same habits and methods of attack as the *limnoria*, but is not as widely distributed. It is slightly larger than the latter genus and its antennae and legs are heavily feathered with long hairs. Most species have a long spine projecting from the middle of the back, though the species found in Hawaii and Samoa has a very short spine, practically a tubercle.

SPHAEROMA BORER.

Sphaeroma is very much like limnoria except that it is considerably larger. They are sometimes found ½ in. in length and ¼ in. in width, and their holes are correspondingly larger.

Even in localities where they are relatively plentiful, animals of this genus are never found in such great numbers as *limnoria*, and while their burrows are much larger, they are not so destructive. This genus has a large tolerance for salinity. They have been found in water of full ocean salinity and also in absolutely fresh water.

The *sphaeroma*, in addition to boring in wood, is also found boring in mud and in soft rock.

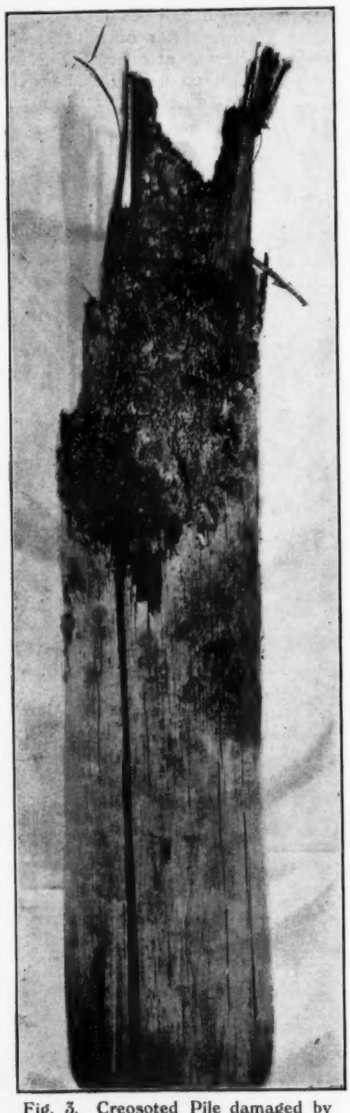


Fig. 3. Creosoted Pile damaged by "Limnoria." Untreated centre has suffered worst.

In general it may be said that the attack of the crustacean borers is less dangerous than that of the molluscans. While they exist in enormous numbers, they are small, and the boring capacity of each animal is relatively small. Their attack is on the outside of the timber where it can be seen, and its progress can be watched, so that if a structure be properly inspected there should be no probability of sudden failure.

Their attack on creosoted timber and piles takes a more dangerous form. A properly treated timber which has not been damaged, is immune from attack for some years, but if the treated outer layers have been punctured by any means so that the animals can secure access to the untreated heart wood, they will attack it. This form of attack cannot be so easily seen as though it were on the surface, and a treated pile may have its heart entirely eaten away while the treated outer shell appears to be intact. (Fig. 3).

CRUSTACEANS RESISTANT.

Under conditions of maximum activity *limnoria* will destroy a 12 in. pile in about two years, and will so weaken it in one year that it may become unsafe.

Unlike the molluscan borers, the crustaceans do not seem to be greatly affected by water temperatures. They are active in the warm waters of the tropics and in the cold waters of the Gulf of St. Lawrence and of the Arctic Ocean at the North Cape. There is not a great deal known about the causes for the distribution of these animals and they may be found in almost any harbour. They have more resistance to toxic wood preservatives than the molluscan borers.

The molluscan borers, which will be discussed in the next article, are the most destructive of the marine borers.

The Port of Grimsby.

"ECHO SOUNDING" GEAR.

In the near future it is quite possible that trawlers will be equipped with an "Echo Sounding" gear which will be of considerable assistance to the skippers in finding suitable fishing grounds. An experiment with such a gear was carried out last month, Friday, August 3rd, by a Grimsby trawler, which later left for the Icelandic Fishing Grounds to try further tests in those waters. The vessel, which therefore ranks as the pioneer trawler in this up-to-date device, is the Grimsby trawler "St. Endellion," owned by Messrs. Croft Baker and Sons. By means of the "Echo Sounding" device, soundings may be taken in any depth of water without the trouble of the old-time method of casting the lead. On the above date the "St. Endellion" made a short trip into the North Sea to test the new apparatus. The experiments were eminently satisfactory, so that, as already stated, the vessel immediately afterwards sailed to Iceland. On the trial trip the "St. Endellion" steamed across the small area to the South-East of Spurn which is known to fisherman as the "Yorkshire Hole." During the experiments it was able to trace the varying depths of the water from twelve to fifty-two fathoms.

In principle "Echo Sounding" is very simple. The sound of the tapping of a spring-driven hammer on a metal diaphragm fixed to the bottom of the trawler is transmitted. The sound travels in all directions, and on striking the bottom of the sea is reflected as an echo, which is picked up by a receiver fixed to another part of the ship, and can be heard on the telephones attached to the receiving gear, which in this case was fixed in the wheelhouse. The time taken by the sound wave to travel to the bottom of the sea and back again is converted into echo feet, and is read off directly on a scale on which the depth of water is recorded in fathoms. The advantages of such an apparatus to the trawler skipper can be quickly appreciated by those connected with this important industry. The time lost in locating a known fishing ground by means of casting the lead has been one of the bugbears of the past, for the trawler has to be stopped in order for the lead line to be cast. Very frequently it happens that hours are lost in this way. With the "Echo Sounding" apparatus, however, the skipper will be able to navigate direct to the spot. With the chart before him and the headphones adjusted, he can take continuous soundings whilst the trawler is going at full speed. "Echo Sounding" is an Admiralty patent. No doubt it will be recognised as an off-spring of another nautical invention employed on submarines during the war—the hydrophone, by means of which submarine noises, such as the beating of the propeller of a ship, could be detected many miles away. The apparatus is manufactured by Messrs. Henry Hughes and Son, Ltd., marine opticians, of London, and a director of the firm, Mr. A. J. Hughes, O.B.E., A.F.R., A.E.S., was on board the vessel when she left for Iceland. Others in the party who made the trial trip into the North Sea included Mr. S. Croft Baker, the managing director of Messrs. Croft Baker and Sons, and a representative of the Humber Electrical Engineering Company, of Grimsby, who adapted the dynamo for the requirements of "Echo Sounding." The "St. Endellion" is certainly well equipped, for in addition she carries a "Deadbeat" compass, of the type used in all British aircraft.

GRIMSBY'S NEW FISH DOCK.

On Friday night, August 3rd, the Grimsby Town Council sat in camera to consider suggestions which have been made with regard to the construction of a new fish dock. The Borough Member, Councillor W. J. Womersley, M.P., reported upon the terms of verbal suggestions which had been made to him by the directors of the London and North Eastern Railway Co. with reference to the construction of the proposed new dock. It was decided that it was desirable that these terms should be submitted to the Council in writing, and without in any way committing the Corporation to any proposal, Coun. Womersley was asked to endeavour to obtain the Railway Company's suggestions in writing for consideration by the Council.

Giant Liners at Cardiff.

The largest liner to come to the Bristol Channel, the s.s. "George Washington," was docked at the Cardiff (Bute) Docks, on Sunday, the 29th July, and sailed on the following tide.

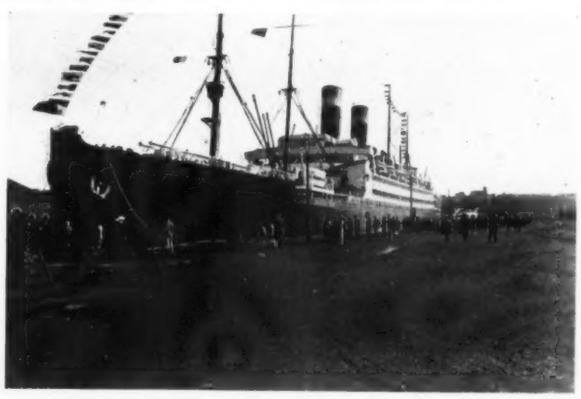
S.S. "George Washington" about to enter Lock.

The "George Washington" is the second largest vessel of the United States Lines fleet operating between this country and the United States of America. The liner brought to Cardiff about 500 Welsh-Americans, who were attending the first International Fraternal Convention of the Loyal Order of Moose, which was held in Cardiff during the week commencing 30th July.

Entering Lock.

This vessel is regarded as one of the most luxurious in the Atlantic service, an enjoys an established reputation among ocean travellers. With a length of 700 ft. and a breadth of 78 ft., and a depth of 50 ft., the "George Washington" has a gross registered tonnage of 23,788 tons, and a net register tonnage of 13,902 tons.

The "George Washington" carried a very distinguished list of Welsh-Americans, the leader of the party being the Hon. J. J. Davis, United States Secretary for Labour.



In Lock.

The arrangements for the docking of this huge liner were in the hands of the Great Western Railway Company, the owners of the South Wales Docks. The vessel was docked in the Queen Alexandra Dock, which has a lock entrance of 850 ft. in length and 90 ft. in breadth and deep-water area of 52 acres.

The arrival of this liner once again emphasises the excellent facilities and accommodation which are available at the Company's South Wales Docks.

The s.s. "Scythia" (19,761 tons gross register and 11,927 tons net register), of the Cunard Steamship Company, also arrived at Cardiff about the same time, bringing over about 500 Welsh-Americans, who made the voyage to attend the Royal Welsh National Eisteddfod at Treorchy, South Wales, during August Bank Holiday Week.

Proceeding from Lock to Dock.

The above vessel did not dock but disembarked her passengers to one of Messrs. P. A. Campbell's steamers, which landed them in the Queen Alexandra Dock.

The Great Western Railway Company made special provision for London and Swansea passengers of both liners, by running special non-stop boat trains from the dock side.

PREVENTING OIL POLLUTION OF THE SEA.

Two Oil Separator Barges have just been delivered to the French Admiralty from the shipyard of Messrs. Worms and Cie., of Le Trait, on the Seine. One is for use at Cherbourg and the other for the harbour at Brest. The Separators are made under the patents of F. Pink of Portsmouth and are similar to one in use by the British Navy in Portsmouth Harbour.

In addition to the Separators, centrifugal apparatus is provided for removing dirt and water from the recovered oil.

The two vessels are identical, being 80-ft. long by 18-ft. 6-in. beam. In the forepart is living accommodation for the crew. The Separator is built into the hull, a smooth surface being provided by filling between the floors with concrete. A large hatch gives access to a space over the Separator and in this stores and spares are kept. Amidships is the automatic oil outlet valve which discharges into a tank of 26 tons capacity.

The barges are not self propelled but a vertical oil fired boiler provides steam for a transfer pump of a capacity of 50 tons per hour. A petrol driven engine works a dynamo to provide electricity for lighting and for driving the centrifugal oil cleaners of which there are two.

The preliminary trials of the barge at Cherbourg took place at the end of July and were satisfactory, the quantity of oil in the effluent being practically negligible.

KIEL CANAL TRAFFIC IN JUNE, 1928.

A report received by the Department of Overseas Trade from His Majesty's Consul-General at Hamburg states that traffic through the Kiel Canal during the month of June was exceptionally heavy. It consisted of 5,018 vessels aggregating 1,794,235 net reg. tons, which, although less than in the same period of 1927 by about 600 vessels, aggregating 130,000 n.r.t., represents an increase over May, 1928, of about 400 vessels of 300,000 n.r.t. Of the 5,018 vessels constituting the total traffic, 2,289 were registered as sea-going steamers aggregating 1,599,047 n.r.t. Of these vessels, 2,169 were cargo and passenger steamers aggregating 1,593,099 n.r.t., 116 were tugs aggregating 5,422 n.r.t. and 4 were fishing steamers of 526 n.r.t. In addition to these 2,330 were sailing craft totalling 110,289 n.r.t. and 188 lighters and barges of 60,406 n.r.t.

The vessels were loaded as follows:—70 with passengers, 128 with coal, 132 with stone, 43 with iron, 498 with timber, 745 with grain, 24 with cattle, 688 with ore and other goods in bulk, 978 with piece goods, 95 with general cargo, 1,617 empty or in ballast (31 per cent. of the whole traffic).

Following the general increase in traffic, vessels with cargo formed a greater proportion than during the previous month. This was especially the case with grain cargoes, whereas stone and iron cargoes fell off slightly.

Personal enquiries regarding all shipping and transport matters should be made at the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

North-East Coast Notes.

The growing importance of the oil import trade of the Tyne was emphasised at the July meeting of the Tyne Improvement Commission, for a report before the meeting contained an application from Shell-Mex, Ltd., for permission to lay two additional pipe-lines, consisting of an 8-inch petroleum spirit pipe and a 4-inch steam discharging pipe in connection with an additional 5,000 ton tank for the storage of petroleum spirit which the Company are erecting at their Jarrow installation. The committee recommended that Shell-Mex be again required to arrange that on the arrival in the Tyne of tank steamers with petrol spirit on board for discharge, the discharging berth at Jarrow be free for the immediate accommodation of the vessels.

A letter was also submitted from the British Mexican Petroleum Co., Ltd., as to the work carried out at their installation at The Lawe, South Shields. The Company was in a position, it was stated, to berth a vessel in ballast up to 550-ft. overall and a loaded vessel up to 480—490-ft. at their jetty. Their berth between the buoys was dredged to 30-ft. at low water. From their installation in 1927 they handled 6,384 tons fuel oil and by the s.s. Invertyne, a small oil-carrying vessel attached to the installation, 5,509 tons of fuel oil, and 465 tons of Diesel oil. They also handled for other oil companies on the river 22,885 tons of oil by the Invertyne.

In the six months of this year it was reported 101 vessels shipped 36,498 tons of oil fuel bunkers, an increase of 21 vessels and 5,607 tons compared with 1927.

In connection with the development of the Shell-Mex Ltd.'s business at Jarrow, Mr. A. W. Lawson, development manager for the Company, explained at a Ministry of Transport inquiry—held on July 27th into a proposal to construct a light railway from the neighbouring L.N.E.R. line to the Mercantile Dry Dock Co.'s premises—that a railway was a necessity. Mr. Lawson explained that they had acquired four acres of land in 1921 and established a depot for bunkering vessels. They also began to develop the distribution of oil inland. For this a railway was a necessity, but progress was so slow that his company let it become known that if the railway was not established they would have to consider the construction of the depot in some other part of the North-East coast. There was no reason, he added, why with proper development there, plant should not be installed for the making of lubricating oil.

The riverside quay at the Tyne Commissioners' Albert Edward Dock, which was opened in the middle of June, has been well occupied and used. Within a few hours of its formal opening the s.s. Leda was loaded with 1,000 tons of coal, and next day (June 16th) saw the arrival of the first special boat train from London, consisting of no fewer than twelve coaches. During the first fortnight of its existence ten vessels were dealt with, 435 passengers disembarked and 975 embarked, 1,181 tons of merchandise were discharged and 1,270 tons loaded, while 4,404 tons of coal were shipped. The outlook for the new quay is regarded as very good, and its proximity to the river mouth is a feature very much in its favour.

Subject to the approval of London Trinity House the Tyne Improvement Commission have decided to substitute electricity for gas as the illuminant at the Groyne and the South Pier Lighthouses and to instal at these lighthouses fog signals to be actuated by electricity, that at the South Pier to take the place of the present fog bell. The estimated cost is £3,200, but this, it is expected, will eventually mean a saving of money. Electric light has already been substituted for incandescent gas as the illuminant at the High and Low Lighthouses at North Shields with completely satisfactory results. The lights have also been made automatic in working.

Sunderland Corporation have decided to guarantee the repayment of principal and interest of £150,000 to be borrowed by the River Wear Commission in respect of works of improvement. As a matter of fact the Commission have already completed work on the East side of Hendon Dock at a cost of £30,000 and they are carrying out other improvements at the coal berths and upon a new quay which will cost about £100,000. The River Wear Commission had under consideration the question of safeguards against fire at the oil berths at the South Dock and the new oil discharging berth in the North Dock, and they have agreed to instal foam extinguishers at each place.

There is still a fair amount of activity in local shipyards, although orders are difficult to secure, yet in the last two months orders for 21 vessels have been placed on Tyne, Wear and Tees. The Tyne Improvement Commission report that in June four vessels were launched of 13,254 gross tons, a decrease of 3 vessels and 18,579 tons. It is interesting to note that Lloyds report that at June 30th there were 42 vessels under construction of 210,753 gross tons, a decrease of eight vessels and 53,825 tons on 1927. In the six months of this year there have been launched 43 vessels of 162,513 gross tons, showing the large increase of 21 vessels and 64,076 tons on 1927.

Amongst a number of shipbuilding orders placed, one of special interest is that given by the Rederiaktebolget Svenska Lloyd to Messrs. Swan, Hunter and Wigham Richardson and Co. Ltd., Wallsend, for two fast passenger steamers for the Gothenburg—London Service. These are to be delivered next May and will mean a material improvement of the service. While dealing with these topics it may be mentioned that the s.s. "Boniface," which was launched on July 23rd by Messrs. R. and W. Hawthorn, Leslie and Co., was the first vessel completed in this country to be fitted with the Bauer-Wach exhaust turbine system.

A considerable amount of work on whaling vessels is being done in the district. The "San Nazario" is at present in the Middle Dock Co.'s yard being converted into a parent whaling vessel. Of 12,000 tons, the "San Nazario," when altered, will be a complete floating factory. The s.s. "Athenic," the well-known White Star liner, of 16,000 tons, is at present being converted into a whaler by Smith's Dock Co. Ltd., at South Bank, for a Norwegian firm, and a third whaling ship, the "C. A. Larsen," is in Messrs. Swan, Hunter and Wigham Richardson's dock, where extensive repairs are being effected, the vessel having been ashore.

Launch of the "Sinnington Court."

A Single-Screw Cargo Steamer.

The Single Screw Cargo Steamer "Sinnington Court," built by Sir W. G. Armstrong Whitworth and Co., for the United British Steamship Co., Ltd., was launched from the builders' Walker Shipyard on the 16th instant.

The launching ceremony was gracefully performed by Mrs. Phillip Haldin.

The "Sinnington Court" is of the complete superstructure type with tonnage openings and her principal dimensions are:—

Length between perpendiculars, 420-ft.; breadth moulded, 56-ft. 2-in.; depth moulded to upper deck, 28-ft. 4½-in.; depth moulded to shelter deck, 36-ft. 4½-in.

She is designed to carry 9,600 tons total deadweight on a draft of 24-ft. 11-in. at a service speed of 10 knots, and has been built to Lloyd's highest class.

The vessel has five large cargo holds, steel centre line bulkhead and is arranged for the carriage of grain. There are 12 steel derricks fitted for handling the cargo.

A steam windlass is fitted on the forecastle, and eleven 7-in. by 10-in. steam winches are installed, four to each mast, two at the bunker hatch and one aft.

Steam steering gear is installed in a house at the aft end of the engine room.

The double bottom fore and after peaks are arranged for water ballast.

Complete electric light installation is fitted throughout the ship.

Accommodation for the captain is provided on the lower pilot bridge and the officers and engineers are accommodated in deck houses about amidships.

The petty officers are accommodated in the forecastle and the seamen and firemen in the shelter 'tween decks aft.

The charthouse and wheelhouse and the wireless cabin are installed on the pilot bridge.

The main machinery of the vessel consists of a set of inverted direct acting triple expansion engines, and the boilers are of the cylindrical return tube type arranged for burning coal, with Howden's forced draught, and designed for pressure of 180 lbs. The cylinder dimensions are: 27-in.—45-in., 75-in. by 51-in. stroke. The machinery is being manufactured and installed by Messrs. J. G. Kincaid and Co., Greenock.

Port Dues in Yugoslavia.

The Department of Overseas Trade has received from the Commercial Secretary at Belgrade the following list of official rates of exchange for the payment of port dues in Yugoslavia during the month of August, 1928:—

	Dinars.
1 Gold Napoleon	219.00
1 Turkish lira	247.47
1 Pound Sterling	276.80
1 American dollar	56.85
1 Canadian dollar	56.55
1 German mark, gold	13.57
1 Belga	7.96
100 French francs	222.65
100 Italian lire	298.00
100 Dutch florins	2289.00
100 Roumanian leis	34.77
100 Danish crowns	1520.00
100 Swedish crowns	1522.55
100 Norwegian crowns	1519.80
100 Spanish pesetas	937.00
100 Greek drachmas	73.90

Personal enquiries regarding all shipping and transport matters should be made at the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, E.C.2.

Harbour Engineering Notes.

THE ELECTRIC DRIVING OF MACHINE TOOLS IN SHIPYARDS.

A large number of machine tools, of many and various types, are to be found in modern shipbuilding yards, and to-day most of these are electrically driven, either direct, i.e., individually, or by belt or chain from motor driven line shafting. The type of control equipment for starting, stopping and regulating the other functions of the motors differs considerably according to the type of tool being driven, and with the rapid progress made since the war in the design of such control gear, very much improved quality and quantity of the work turned out is possible, while much more intelligent and profitable work can be extracted both from the motor and the machine tool it drives.

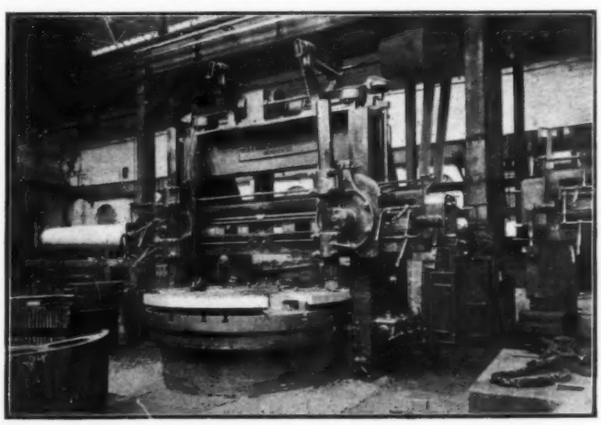
One of the most important groups of tools are to be found in the various platers' sheds, sheet iron shops, boiler shops, and smithies, for the purpose of rolling, bending, shearing, planing, punching and drilling the various steel plates and sections, angles and bars, which are required for the main structure of the ship.

Prominent among this group are the various types and sizes of rolls, which to-day range from the enormous plate bending and straightening rolls, which may exceed 20-ft. in length, for dealing with steel plate up to 2-in. and more in thickness, down to smaller rolls of many and special design, such as mast rolls, and rolls for bending, straightening steel sections, angles and bars. These rolls are, of course, arranged with individual motor drives, and in the great majority of cases the motor is reversible. The larger plate rolls may also be fitted with motor operated screw downs.

The starting duty of such motors varies widely, and may at times be very heavy, while the motors are often required to start and reverse frequently on a heavy load. It is obviously essential that the control gear and the motor must be of the very best design and workmanship, and robust in construction to withstand the heavy duty required and also the arduous treatment they are likely to receive in the yard.

Often, when a batch of plates require straightening, the rolls are started up in one direction and run for a time continuously, the plates being passed through, one at a time, in one direction only. For this service the duty is not very severe so far as the control gear is concerned. More often, however, especially where the various sizes of plates must be bent, the rolls are started up, and after the plate has entered, it may be passed backward and forward, the motor being reversed at each end of the stroke. With a short plate, or where the plate is entered sideways, the stroke may be very short, and the reversals frequent, and the duty on the motor and control gear is then very heavy.

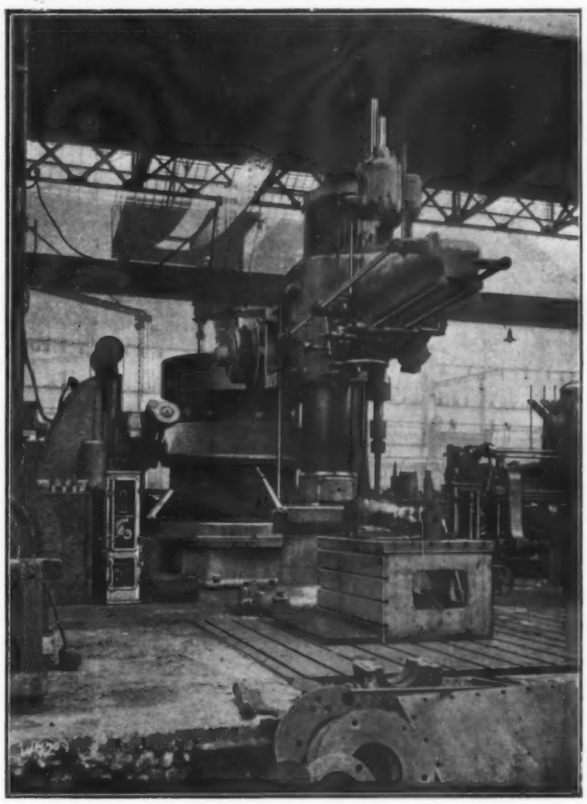
Until recent years the type of controller most frequently installed with motor driven rolls was the hand operated reversible drum type, and even at the present day the drum controller is in common use, especially for the smaller rolls. For the smaller sizes, and with a careful operator, the drum controller gives fairly satisfactory results, but everyone who is acquainted with shipyard methods is only too well aware that the average operator knows very little whatever about electrical gear. At each reversal the drum operating lever is more often than not swung across from full off to full on without a pause, so that burn-outs both of motors and resistances are of frequent occurence.



Boring Mill with Conspede panel. Sir W. G. Armstrong-Whitworth and Co., Ltd., Openshaw.

Contactor control gear is undoubtedly the best type in every respect for operating these motor driven rolls. A typical equipment for controlling a d.c. reversible motor operating a plate mangle consists of an enclosed reversible mill type contactor panel, with a liberally rated resistance separately mounted, and a separate three or five speed reversing master control drum. The accelerating contactors are shunt wound and controlled by series relays, a plugging feature being incorporated. The equipment is generally similar to that already in use in connection with the control of crane motors, and arranged for plain series control in both directions.

With such an equipment the maximum rate of acceleration of the motor is dependent upon the series relays, and the operator is quite unable to hasten the acceleration, although the master drum will allow him a certain amount of speed control in both directions.



A 9-ft. radial Asquith drill, equipped with Conspede panel.

The motor is protected against damage due to rapid reversals by the automatic introduction of plugging resistance. Further, when it is required to bring the rolls to a quick stop, this can be effected by bringing the master drum back through the "Off" position into the reverse position, the plugging feature then acting as a brake; the master switch being, of course, quickly returned to the "Off" position before the motor has time to accelerate in the reverse direction.

A number of shears and guillotines of various types and sizes are used for cutting and trimming steel and iron plates to size. Numerous combined machines, designed for shearing, punching and joggling, or for shearing and punching only, will also be found; several of the latter type usually being installed at various convenient points about the yard, or in the open. Most of these machines are driven by constant speed non-reversing motors, but in certain cases where the machines are required to handle plates varying considerably in thickness, time may be save by speeding up the motors when on comparatively light duty, and this is arranged for by shunt field control in the case of d.c. motors. Although the above machines are started up light, the inertia of the moving parts at starting is in most cases considerable. Starting is usually infrequent, and the machine may run for long periods when started. For starting up d.c. motors on this service a heavy duty starter may be used. Preferably, however, a complete heavy duty Conspede panel should be employed, or, where speed control is required, a Varispede panel.

Another important class of tools includes the various planers and plate edge planers, the latter being designed for planing the edges of steel plates true after shearing.

Yet another class are the various types of drilling machines. These comprise single radial type drills, drills and countersinkers, multiple drills and similar machines. A suitable type of control equipment for use with a d.c. variable speed drilling machine motor consists of an automatic starter controlled by stop and start push buttons, and embodying a hand operated shunt field regulator with a pre-set speed feature. The push buttons may be fixed to the movable drill head if desired.

Alternatively, a self-starter may be used, with a separate drum type combined master switch and shunt field regulator; and the master drum may then be operated through a splined shaft by means of a hand wheel fitted at the drill head.

Among other miscellaneous machine tools found in the platers' sheds, etc., may be mentioned motor operated cold saws for

cutting steel sections, angles, bars, etc., when cold; special angle cutters, machine hammers, boiler tube benders, motor driven grinders, motor operated blowers in connection with the furnaces and forges, all of which should be motor driven and require proper starting gear.

The widest variety of machine tools will probably be found throughout the various engine shops in connection with the shipyard. Chief among these are lathes, boring machines, and milling machines of all sizes and types, both horizontal and vertical, ranging from a lathe capable of taking a section of propeller shafting for a first class liner, or a boring machine capable of boring out a low pressure turbine casing, down to small automatic machines designed for turning out small screws.

Other types of tools which may be mentioned are planing machines, vertical and radial drills, sensitive drilling machines, multiple drilling machines, slotters, shapers, gear cutters, drilling and tapping machines, screw cutting machines, studding machines, slotting and key seating machines, metal saws, various presses, punches, profiling and grinding machines.

Many of the small single purpose machines operating at constant speeds are even now driven from line shafting, but the adoption of the individual electric drive is steadily increasing.

The method of controlling milling and boring machines varies somewhat with the size and type of machine. For small machines the control gear is generally similar to that for lathes. Many different types of boring machines are in use, and the control of these usually requires special consideration in each case.

To take a typical example: A large horizontal boring machine designed for boring out turbine casings, etc. The boring shaft is driven by a variable speed non-reversing motor; and the machine table is operated either through suitable reversing gear from the main drive, or by means of a separate reversible motor, and the table speed is very low. The speed range required may be considerable, especially in the case of the main boring motor, and a d.c. machine is almost essential. Consequently, where the power available is a.c., it is customary to provide d.c. operating motors, and to instal a small motor generator set for supplying the necessary power.

A suitable control equipment comprises: (1) For the boring motor, an automatic starting panel, which should also include a hand operated shunt field regulator with an interlock for providing a pre-set speed feature, and to ensure starting the motor with full field; the motor is started, stopped and inched by means of push buttons. (2) For the table motor, an automatic reversing panel with electrically interlocked reversing clappers. A hand operated shunt field regulator is also included, with an interlock for providing a pre-set speed feature, and to ensure starting with full field. The motor is inched, started in either direction and stopped by means of push buttons.

It is usually desirable to interlock electrically the two control panels to ensure first, that the boring motor must be started before the table motor, and, second, that in the event of the boring motor stopping from any cause, the table motor immediately stops also.

Still a further class of machine tools will be met with in connection with the saw mills, and in the carpenters', joiners', cabinetmakers', and patternmakers' shops. Chief among these are various types and sizes of circular saws and band saws, planing and surfacing machines, jointers, shapers, mortising, dovetailing, tenoning, moulding and boring machines and woodworkers' lathes.

A large circular saw table is operated by two motors, i.e., the main saw motor and an auxiliary motor for operating the travelling table. The saw motor is non-reversing, and although it usually starts up on light load, it may occasionally be required to start up against a very heavy load should the saw happen to jam or stop in the middle of a cut. The table motor is reversible, and usually starts up against full load. It is an advantage to be able to vary the speed of the saw motor for different types of saws, and for cutting varieties of timber, and it is necessary to be able to vary the speed of the table motor so as to alter the rate of feed to suit the different thicknesses of timber.

For the control of the saw motor, which is only started up infrequently, a hand operated control panel such as the Varispede may be used. Preferably, a self-acting starter with a hand-operated interlocked field regulator for speed setting is installed, the motor being started and stopped by push buttons.

For the control of the table motor an automatic reversing panel should be provided with interlocked reversing clapper switches. A hand operated interlocked field regulator for speed setting should also be included, and the motor inched and started in either direction, and stopped by means of push buttons.

The two control panels should be electrically interlocked to ensure that the saw motor will always be started up before the table motor, and also that, in the event of the saw motor stopping from any cause, the table motor will immediately stop also. A centrifugal switch is fitted on the saw spindle and connected in the control circuit to the panels, so that in the event of breakage of the driving belt and the consequent stoppage of the saw, the two motors are immediately stopped. Shunt limit switches may also be fitted if desired to prevent over-travel of the saw table in either direction.

It is very important that all switchgear used in connection with saw mills should be totally enclosed and dustproof owing to the risk of fire, and the same precaution should more or less be observed for all control gear used in connection with woodworking machinery. Many of the other woodworking machines are still commonly driven from line shafting, but with the more modern types of tools individual motor drive is fast coming into favour.

Many other applications of electric drives and control gear could be mentioned in connection with various motor drives met with in the test bays, and throughout the smaller departments such as the plumbers' and tinsmiths', electrical department, coppersmiths', brass-finishers', galvanising plant, upholsterers', sailmakers', painters' and riggers', though these departments are more or less covered by the previous remarks.

CURING CONCRETE.

A new method of curing concrete by means of an asphalt emulsion has been introduced recently and is proving successful for all kinds of concrete work. This emulsion is applied to freshly finished concrete in the form of a fine spray, and the adherent continuous film of asphalt left by the emulsion prevents the evaporation of water from the concrete mixture. It is suitable not only for road surfaces but also for concrete foundations, pavements, floors, platforms and similar work. As it maintains conditions suitable for hydration for a longer period of time than other methods, it is claimed to accelerate curing. This acceleration is caused by its absorption of sun heat and is not the result of chemical action, as the emulsion is chemically inert. The machine used for spraying road surfaces consists of a 40-gallon galvanised iron tank and an air compressor unit driven by a single cylinder petrol engine, the whole being mounted on wheels. The emulsion is applied at the rate of 150 to 200 square yards per hour.

STUDYING BUILDING ACOUSTICS PHOTOGRAPHICALLY.

Of the various methods that have been developed recently for the study of the acoustic properties of buildings to be erected, the Burgess method seems to promise the greatest success, since it can be employed on models of proposed buildings. The principle of this system is the photographing of light rays on small models showing the points of interference with light from a given point representing the position of the source of sound, whether speaker or a musical instrument. The sections to which particular attention is directed are the floor plan, the longitudinal section and several cross sections taken at various parts of the building. These features are then laid out in miniature on stiff white paper. The section to be studied is placed on a flat surface, and a highly polished strip of metal ¼-in. high is placed along the boundary lines of the section. This strip is bent to conform to the outline of the section and held in place by weights. The model section is then placed in a dark room and light is shown at the source of sound, and the reflections from the polished metal strip are found to make the same pattern on the paper as those obtained by a draughtsman drawing carefully constructed lines showing the beams of light from the main point and those from the reflecting surfaces. A camera is placed vertically above the model and the beams of light are photographed. This method is found to be far more reliable than the draughting method, since errors in working out all the angles of incidence and reflection are avoided. This method has already been applied very successfully to several proposed and existing buildings.

GRID RESISTANCES FOR INDUSTRIAL SERVICE.

There are many applications in electric control gear, both a.c. and d.c., for which unbreakable grid resistances are particularly suited. On account of their light weight and the resilience of the strip material forming the grids, these resistances are specially adapted for apparatus which is subject to vibration, and may be used instead of cast grids. Recently, the construction of these grids has been greatly improved, and, with the assistance of some patented machinery used in their manufacture, are far superior to the older types. It may be mentioned that the newer patterns have only recently been placed on the market.

Every resistance is expressly designed for the equipment with which it is to be used, the grids being assembled to suit each individual requirement. Apart from the resilience of the grid material which renders them unbreakable, these resistances possess many advantages. There are no joints in a complete tier, as they are unnecessary unless the section of the strip changes. This obviates the risk of trouble from vibration or the expansion and contraction of the grids. The resistance values can be accurately adjusted since each loop is a possible tapping point to which leads can be connected easily without disturbing the grids. Although they are so firmly supported that adjacent grids cannot touch each other under the most severe conditions of service, this form of resistance is the lightest and most compact for all but the smallest ratings. They are particularly efficient for continuous duty. These grid resistances are marketed by the B.T.H. Co. of Rugby.

PRODUCING DUCTILE WELDS.

A new method of electric arc welding has been devised by means of which a strong magnetic field is superimposed on the arc flame of the welding apparatus which tends to hold the flame in a straight line and to give it a gyratory motion of great velocity. A series of tests made on welds produced in this way showed that the welds had as great ductility and strength as equivalent section of mild steel. The welds were sawn from the plate, and the resultant bars twisted through 1080 deg., or three complete revolutions, without showing any signs of failure. The method has so far been applied to the construction of derricks, and it is claimed that the welding machine places welds at the rate of 40-ft. per hour for each welding head. It is also stated that no filler rod is used, since the arc fuses the various plates together. In the welding machine using this process the welding heads have their electrode holders crossing each other at a sharp angle. With the ordinary process, i.e., without a superimposed magnetic field, it would be impossible to use two flames in such close proximity since one would continually blow the other out. With the new head, however, they work smoothly and without conflicting.

ELECTRIC OPERATION OF SLIPWAY HAULAGES.

An ingenious form of electric drive has recently been devised for operating a travelling slipway haulage in shipyards. The slipway usually consists of a very substantial moving framework or carriage running on small roller or wheels along a fixed rail track, built at an angle of 5 deg. to 10 deg. to the horizontal, and with the inboard end well above high water level, the outboard end being well below low water level. The slipway is designed for hauling up vessels of comparatively small tonnage out of the water for repairs, instead of dry-docking them, and the carriage is moved by a special chain haulage gear. These haulage gears are commonly driven by slow speed steam engines, but electric drives are now being designed for them, the slipways being operated by motor through suitable reduction gearing. One or two motors, totalling 200 h.p. or more, may be fitted to such a haulage. The motors are reversible but are only called upon to operate under heavy load when hauling the carriage up the track, and the rate of haulage is usually very slow.

When starting the load in the upward direction, the starting load on the motor may be extremely high, especially when the vessel is no longer water-borne. Further, the motor may be required to start under these conditions several times in succession. In the downward direction the load is carried by gravity, the motor only being required to operate the gearing in the reverse direction and the load being comparatively light. Naturally, on such drives very efficient braking arrangements are necessary. The motor is controlled by a reversible type contactor panel, specially designed for this heavy service. A dynamic braking feature is incorporated, and the panel may be controlled by means of "Forward," "Reverse" and "Stop" push buttons. For the brakes in connection with both d.c. and a.c. control equipments, the magnetic Type M and the motor-operated Type RS brakes are employed, these being found the most reliable on account of their rugged construction, simplicity in design and ease of adjustment.

Ribble Dock Undertaking.

Some interesting information of the Ribble dock undertaking was given by Mr. J. Barron (engineer and General Superintendent) on the occasion of the annual inspection by the members of the Preston Town Council. The party were accommodated on the "Perseverance," and as she passed out of dock, the councillors and aldermen were given the opportunity of viewing two bucket dredgers and sand pumps at work.

Mr. Barron explained that the high tide of October 29th, 1927, brought silt into the river which was largely carried away from the upper reaches by the vast volume of water returning to sea on that ebb tide, but subsequent to that time considerable quantities of sand and silt were carried into the navigation on high tides from Freckleton Farm, Hutton Marsh, and Lea Marsh, on occasions when there was no great volume of water to carry it out of the upper reaches. While Freckleton and Lea banks are made up, Hutton Marsh bank is not, and silt is still coming into the navigation from that place. Steps are being taken to minimise this by allowing the tidal waters to flow off by wide gaps instead of by concentrated runs. Normal conditions were restored by June and now the sand in the upper four miles was five inches above sea low water, and in the next four miles nine inches below sea low water, the whole eight miles averaging two inches below sea low water. The highest place in the river bed during the year 1927, averaged 3-ft. 11½-in. above sea low water, the first half of that year being 3-ft. 9-in. and the second half, 4-ft. 2-in., and ranged from a maximum of 5-ft. 1-in. to a minimum of 2-ft. 10-in. The first half of this year averaged 3-ft. 2-in., and had ranged from 3-ft. 8-in. to 2-ft. 7-in. Thus there was an improvement of 9½-in. in depth at the shallowest place since last year. From eight miles to 11 miles the water area had decreased by 31 acres. The depth also had decreased. The area with a depth of 12-ft. or more below sea water had lessened by 13⅜ acres. From 11 to 14½ miles—to the end of the training walls—the area of water at low water had again increased by 24½ acres, the only decrease being an area of ¼ acre of 21-ft. deep and over below sea low water, indicating that some of the sand from the upper reaches had settled in the deeps at the sea end of the estuary.

The narrowest parts of the channel were:—620-ft. wide at 10 miles, 680-ft. at 13½ miles, and 470-ft. at 14½ miles and for half a mile beyond. These measurements were much the same as last year's. Beyond the end of the training walls, the channel and banks kept constantly moving. For the past four years the general direction had been west for half a mile beyond the end of the walls and then slightly north of west. To secure its direction the Ribble Navigation Commissioners' recommendations to extend the walls for a further 1½ miles would have to be carried out.

The extension would cost about £100,000, and occupy seven years time, and would afford a security against deterioration in the depth the Corporation did not now possess. Further borrowing powers would be required for the extension of walls and for the general purposes of the navigation. Only £2,300 was left of the 1905 Act training walls borrowing powers, £1,160 for Lytham Dock wall, and £12,762 for the general purposes of the undertaking, and as they were already committed to the expenditure of £7,000 on a boilerhouse, culverts and accommodation for tankers crews, they had only £5,762 left for any equipment of the dock which might be necessary. Power was still left to borrow £31,350 for deepening the upper reaches the money being tended for placing stones on the walls in the deepened portion. This work was now in hand, but the whole of the sum mentioned was not likely to be wanted for the purpose.

Mr. G. J. Merriweather (traffic manager) said that the total imports for the year had been 624,008 tons and the total exports were 153,722 tons, a total of 777,725 tons which represented a combined increase over the previous year of 11,500 tons. The imports of wood pulp amounted to 209,000 tons, a decrease of about 15,000 tons; timber advanced from 113,114 tons to 159,502 tons. In six years, petrol imports had expanded from 3,661 tons to 83,221 tons. Storage was provided for 17,000 tons of petrol or 5,100,000 gallons. Recently the Corporation had let a piece of land to the Cleveland Petrol Products, Ltd., which proposed to provide storage for 6,000 tons of petrol. Vessels using the port, said Mr. Merriweather, had grown considerably in tonnage. The average was just over 348 tons. Of 190 steamers arriving at Preston in 1914 only 44 were drawing 17-ft. to 19-ft. 7-in. of water. Of 230 vessels arriving last year, 42 drew 17-ft. to 18-ft., 41 drew 18-ft. to 19-ft., 24 drew 19-ft. to 20-ft., and three drew 20-ft. to 21-ft. The largest ocean going vessel which used the port was the s.s. Katendrecht which brought 4,165 tons of cargo on a draught of 18-ft.

The total sum invested in the undertaking up to March 31st last was £1,841,861, and by the application of sinking fund £613,595 had been repaid, leaving the debt outstanding £1,228,266. Had this year's balance of revenue been applied solely to paying interest on loans this would have amounted to approximately 4½ per cent., but as a result of the methods by which a corporation could borrow money, in that it had to provide for sinking fund, not only were they called upon to maintain their undertaking and keep it in perfect condition out of revenue—which sums were included in the expenditure side of their accounts—but capital had to be repaid over a period of 60 years. During the year they had disbursed in wages, etc., approximately £145,000. This did not include payments of wages made by private stevedores.

Trials of the "Dayspring."

The Steel Twin Screw Survey and Buoyage Vessel built to the order of the Crown Agents for the Colonies for the Government of Nigeria, by Sir W. G. Armstrong Whitworth and Co., Ltd., Walker-on-Tyne, completed her final and official full speed trials at sea under full load conditions on the 31st July, with highly satisfactory results.

The vessel, which is specially and strongly constructed for buoyage and survey work, has a length of 190-ft. at the water line, breadth 36-ft., with a moulded depth of 18-ft. 6-in.

The main propelling machinery supplied by the Shields Engineering and Dry Dock Co. consists of two sets of triple expansion surface condensing engines, capable of propelling the vessel at 9¾ knots. Steam is supplied by two cylindrical boilers, coal fired, working at a pressure of 180 lbs. per square inch.

The Crown Agents for the Colonies were represented at the trials by Mr. H. Hoeburgh, also Engr. Lt. Commander L. Rickinson and Mr. Walton, of Messrs. Wells and Rickinson, Consulting and Inspecting Naval Architects and Marine Engineers, the Shipbuilders by Mr. R. Giles, Yard Manager and Mr. J. W. Gibbeson, Superintending Engineer, and the Shields Engineering Co. by Mr. R. Turnbull.

Port of Leith.

Opening of New Grain Warehouse, 20th July, 1928.

GENERAL DESCRIPTION OF COMMISSIONERS' GRAIN PLANT AND STORAGE SILOS AT THE EDINBURGH DOCK.

The old Grain Warehouse at Leith was built in 1903 by a private firm and was taken over by the Leith Dock Commissioners in 1906, since when it has been worked as part of the Dock Undertaking.

The old Warehouse consists of a series of grain silos capable of holding 20,000 tons of grain. The bins are constructed of timber on what is known as the "Interlaced" System, the whole being surrounded by a brick wall to protect the timber from the weather.

Grain Discharging Plant (seen from roof of Warehouse Tower).

The Ship Discharging Plant used in connection with the old Warehouse is placed on the South Quay of the Edinburgh Dock, and consists of a bucket elevator capable of discharging 300 tons of grain per hour, with two small pneumatic elevators each capable of discharging 60 tons of grain per hour. The elevators are of the stationary type, and discharge on to two conveyor belts which are carried under the roof of the Dock Shed, and from the end of the Shed to the Grain Warehouse, where the grain is elevated to the top of the building and discharged into the silos.

The new Grain Warehouse, which is built entirely of reinforced concrete, adjoins the old Warehouse, and is connected to it by means of a covered-way. It is a rectangular shaped building about 160-ft. long by 114-ft. wide, and is so arranged that it will be operated along with the old Warehouse, thus forming one complete unit.

Grain can be discharged from ships by means of the Elevator Plants either on the north or south side of the Edinburgh Dock and taken into either the old or new Warehouse as may be required.

The new building is arranged to form (1) a storage section consisting of a series of grain silos with a small proportion of grain storage floors with a total capacity of 16,000 tons; and (2) a delivery section consisting of a series of grain delivery silos of a total capacity of 2,000 tons, and the necessary delivery, distributing, and weighing machine floors.

The storage section is provided with 55 silos each about 12-ft. 6-in. by 14-ft. holding 1000 quarters, and 32 silos each 14-ft. by 6-ft. 3-in. holding 500 quarters of grain, all approximately 77-ft. high, with reinforced concrete hopper bottoms. Seven grain storage floors are provided at the east end of the storage section, and these have the necessary bulk shoots, sack shoot, grain cleaning machinery, stairways, etc.

The delivery section consists of a series of 24 delivery silos, each holding 500 quarters of grain, with an elevator tower approximately 150-ft. high above the ground level, and this is provided with seven floors to carry the machinery, appliances, and equipment necessary for the handling of grain and the cleaning up of dust which arises when grain is being handled. The delivery silos are fitted with steel hopper bottoms which feed into portable automatic sack weighing machines.

A passenger lift and stairway extends from the ground level to the top floor of the elevator tower.

The roofs are of reinforced concrete, with the upper surfaces covered with layers of asphalt and lithocrete.

The design of the whole of the reinforced concrete in the building has been arranged to comply with the latest fire resistance construction.

Along the front of the building a verandah is provided, so that waggons and lorries can be loaded under cover.

A suitable fire service and fire escapes have been supplied throughout the building.

The two Pneumatic Plants erected on the North Quay of the Edinburgh Dock are of the travelling type, and can therefore be placed at any point to suit the hatches of the grain-ship to be discharged. They are each capable of discharging 150 tons of wheat per hour from a ship alongside, and can automatically deliver the grain on to either of two conveyor belts which are placed in the gantry over the roof of the Dock Sheds. Each plant has two pipes, the lower ends of which are lowered into the hold of the ship, the upper ends being connected to a large steel canister. The air is exhausted from the canister by means of a Rotary Air Pump driven by an electric motor. As the air is exhausted from the canister it is immediately replaced by air rushing through the nozzle at the lower end of the pipe in the ship's hold, and this carries the grain along with it up the pipe and into the canister. By means of a mechanically operated air lock the grain is discharged from the canister into a 2-ton automatic weighing machine, and after being again elevated by means of a bucket elevator it is discharged through a pipe on to the belt conveyors in the gantry.

Suitable power winches for lowering and raising the pipes in the hold of the ship are provided in the upper part of the plant.

In order to take the grain from the Quay to the Warehouses two belt conveyors, each capable of carrying 150 tons of grain per hour, extending the whole length of the Quay, and from the Shed to the Warehouse (a total length of about 800-ft.), are installed. The conveyors are housed in a steel gantry carried above the roof of the Shed and over the railways and roadways between the Shed and the Warehouse. The conveyors discharge the grain through shoots in the north wall of the Warehouse, where it is transferred on to another conveyor belt running the whole width of the building at the ground level; and by means of automatic "throw-offs" it can be fed from the conveyor belt to any one of the four bucket elevators. These elevators raise the grain to the top of the machinery tower a height of about 150-ft., from which point the grain is passed by means of shoots to the nearer bins or to conveyors running above the top of the storage bins, and thence into any of the eighty-seven bins.

When it is desired to discharge grain from the Warehouse to the various mills, etc., the grain is drawn off at the bottom of the storage bin on to conveyor belts under the bins at the ground level, the conveyors delivering the grain into the bucket

elevators which again take it to the top of the tower. It is then passed through one of the 3-ton automatic weighing machines and discharged either through a delivery bin or direct through shoots to bulk waggons or bulk lorries on the ground floor. If the grain is required to be delivered in sacks, it is drawn from the delivery bins and weighed by means of portable automatic weighing machines, after which the sacks are passed by means of sack shoots to railway waggons or lorries standing under the verandah outside the building.

Each storage bin is provided with an electrically controlled temperature recorder, and each recorder is so arranged that the temperature of the grain in the bin, at points every 10-ft. down the bin, can be instantly recorded on a switch board placed at the east end of the distributing floor.

The whole of the electric motors and lighting of the building are controlled from an electric Switch House on the ground floor. In this House is also placed a Sequence Board, which makes it possible to arrange all the electric motors driving the various conveyors and elevators from the ship to the bin in sequence, so that in the event of any one of the machines breaking down all the other machines in the line immediately stop, thus preventing a stream of grain carried on the conveyor belts from being piled up and spilled at the point on the line where the break-down has occurred.

Grain Warehouse Extension (view from North-west).

In order to supply the additional electric energy required for the new Plant a new Electric Sub-Station has been constructed adjacent to the Warehouse. The electric energy is supplied by the Edinburgh Corporation in the form of alternating current of 6,600 volts, and this is converted into direct current at 460 volts by means of two 750 K.W. "Peebles-La Cour" Motor Converters. The high tension alternating switchgear controlling the main cables is placed against the east wall of the Sub-Station, while the low tension direct current switchgear controlling the cables supplying the grain plant is on the south wall. An interesting feature of this Sub-Station is the fact that it is arranged so that it will be controlled from the switchboard of the Commissioners' Main Station at the Albert Dock, nearly one mile away. This is done by means of a series of relays which are placed opposite each of the motor converters at the west wall of the Station, and these are connected by a pilot cable to the control panel in the Main Station. This is probably the only Sub-Station in Scotland which is remotely controlled in the manner above described.

In order to deal with the increased traffic of the extended Grain Warehouse, a new Office has been built for the Warehouse Manager and Staff in a convenient position where the road transport to and from the Warehouse can be controlled.

The Superintendent and Engineer to the Commissioners, Mr. Alfred H. Roberts, O.B.E., M.Inst.C.E., has been responsible for the whole of the scheme; while the preparation of the designs of the Buildings, Machinery and Equipment, and the construction of the work was carried out under the direction of Mr. J. Dalgleish Easton, M.Inst.C.E., the Chief Assistant Engineer, assisted by Mr. G. D. Ross, A.M.Inst.C.E., who acted as Resident Engineer for the Building and Equipment; and Mr. Andrew Hay, G.I.E.E., who has supervised the electrical installation.

Recent Legal Decisions.

A decision of much importance, and particularly so to dock authorities who are large employers of labour, which to a considerable extent is necessarily casual, was recently given by the House of Lords in the case of *Bevan v. Nixons Navigation Co.* One of the rules laid down in the workmens Compensation Act for calculating the amount of the weekly payment due to a partially injured workman proceeds on "one-half the difference between the amount of the average weekly earnings of the workman before the accident and the average weekly amount while he is earning or is able to earn in some suitable employment or business after the accident." The question in *Bevan v. Nixons Navigation Co.*, as well as in the earlier case of *Cardiff Corporation v. Hall* (1911), turned on the interpretation of the words "able to earn." Did they mean that the Court has to consider either what the workman was able to earn having regard to his physical condition, and that alone, or what he is able to earn having regard in addition to his physical condition to the fact that employment is available for the workman if he fairly attempts to obtain it.

A majority of the judges in each of the cases mentioned were in favour of the former view. Thus in the "Cardiff" case, Lord Justice Buckley said:—"the workman is not entitled to compensation for every injurious result of the accident. He is entitled only to compensation for personal injury resulting in incapacity for work, and that compensation is to be ascertained as directed, including an ascertainment of the amount which he is earning or is able to earn after the accident. It has been laid down that upon an original arbitration, the state of the labour market is altogether outside the question of compensation. The same, in my opinion, is true upon an application to review. The two propositions are, of course, distinct: First, that owing to incapacity for work arising from the accident, the condition of the workman is such that his labour is not saleable, or is saleable only at a reduced figure; and secondly, that his labour is saleable or is saleable at the same figure as before the accident, but that he has failed to find a purchaser. The former and not the latter is the relevant proposition in a question of compensation."

To express the same thing more briefly—inability to earn is inability to get employment owing to some incapacity for work personal to the workman, to the exclusion of inability to get employment owing to the state of the labour market. The employer may be called an insurer of capacity to work, but he is not an insurer of a right to work. The Workmens Compensation Act is not a right to work Act. In any event that was the principle which was followed by a bare majority of the Court in *Bevan's* case and must now be regarded as a final ruling on the point.

The case of the "Harkaway" (44 T.L.R. 645) is notable for the interesting opinion delivered by Mr. Justice Bateson with regard to obstructions in the fairway of navigable rivers. The action was brought by the owners of the motor vessel "Harkaway" to recover the damages sustained by her when proceeding up the River Medina, in the Isle of Wight; she ran upon the anchor of the defendants' barge, "The Louisa," which was moored at the side and exhibiting an anchor light. In the olden days from 1663 (earlier perhaps) and thereabout cases of this sort were quite common when light draught vessels were going about in shallow waters and anchors were being used to keep them in position. It was laid down so far back as the case of *The Warewell v. The Susan* (1663), that it was neglect to leave an anchor in a navigable river without a buoy. Referring to that decision, his lordship said: "I think that is good sense and it has stood for several centuries. I have consulted the Elder Brethren, and they also think it good sense that if people put an anchor down in channels which are shallow at low tide they ought to be buoyed."

It was argued in defence that no by-law had been made giving warning as to anchors, but the learned judge was of opinion that no by-law was necessary to prevent people from being negligent, that is a matter of common law, on his attention being called to the case of *Hammond v. Pearson* 1 Campbell 515, in which Lord Ellenborough said—"It is a peremptory law of navigation that when any substance is sunk in a navigable river, so as to create danger a buoy shall be placed over it for the safety of the public. This is proper and specific notice which all understand and are bound to attend to." Mr. Justice Bateson observed:—"That seems to be good law fairly applicable to this case, with the exception that there Lord Ellenborough was speaking of a barge and here I am speaking of an anchor, but it seems to be that where an anchor or the fluke of an anchor sticks up out of the bottom of a channel, it is perhaps more dangerous than a larger object like a barge." It may be noted that Mr. Marsden, in his work on "Collisions at Sea" says:—"Before the days of floating docks damage to ships by grounding upon unbuoyed anchors in the Thames and elsewhere was a very frequent cause of action. The ship where anchor was unbuoyed was invariably found at fault."

The Harbour Plan of Chicago.

Development of Group of South Michigan Harbours part of Scheme advocated by Independent Committee on Chicago Harbour and Port Survey.

(Continued from page 316.)

TRAFFIC.

EXISTING WATERBORNE TRAFFIC IN THE CHICAGO REGION.

There are nine harbours in the Chicago Region at which commercial vessels receive or discharge cargo. These are Racine, Kenosha, Waugegan, Chicago, South Chicago, Indiana Harbour, Michigan City, and the private harbours at Buffington and Gary. Published commercial statistics show the following combined waterborne movement for the seven public harbours.

Year.	Tons.	Value.	Passengers.
1910 ...	12,100,668	$	1,730,913
1911 ...	11,152,958		1,829,395
1912 ...	12,500,631		1,677,395
1913 ...	14,740,880	427,670,000	1,311,177
1914 ...	12,547,142	430,677,000	1,327,660
1915 ...	12,794,599	411,331,000	733,981
1916 ...	15,391,863	489,419,000	1,386,593
1917 ...	14,868,615	490,124,000	959,894
1918 ...	16,093,787	392,108,000	759,352
1919 ...	13,416,106	346,453,000	1,104,994
1920 ...	15,406,692	340,516,000	992,989
1921 ...	11,659,299	263,357,000	1,410,223
1922 ...	15,797,263	360,882,000	1,417,041
1923 ...	18,469,812	324,593,000	1,409,145
1924 ...	15,715,264	401,593,000	1,212,613
1925 ...	20,162,987	407,916,000	1,400,557

No statistics are published for Gary Harbour, but it is understood that the commerce at that port now varies between four and six million tons annually. It consists of ore and limestone, and has a value approximately $25,000,000. Buffington Harbour has been in use for only a short time so that no statistics of value are available.

The table showing 1925 commerce in the Chicago Region involves some duplication due to the fact that a small amount of interport trade exists. There is also an intraport movement on the Chicago River and Drainage Canal amounting to about 750,000 tons annually with a value in the neighbourhood of $100,000,000, but this has not been included.

In round numbers, and allowing for these corrections, the total waterborne traffic in the Chicago Region at the present time varies between 20,000,000 and 25,000,000 tons annually with a value of between $450,000,000 and $500,000,000; in addition there is a passenger traffic, largely out of Chicago Harbour, involving the annual movement of about 1,400,000 persons. Combined arrivals and departures of vessels amount to 12,500, with a net registered tonnage of approximately 25,000,000 tons.

The bulk of the trade by water through the ports in the Chicago Region is domestic. There is some foreign trade, however, chiefly with Canada, and principally out of Calumet and Chicago Harbours.

Most of the inbound cargo is for use in the Chicago Region; by far the bulk of it for consumption by the steel industry. A small amount of coal is trans-shipped, some 200,000 tons of anthracite being interchanged with rail for consumption in the interior. On the other hand, the bulk of the outbound movement consists of rail-lake interchange, two-thirds of which is grain from the interior.

FREIGHT RATES.

FOREIGN TRADE.

Rail rates from an interior point to different ports on the seaboard are not necessarily the same. Differentials have been established which are intended to retain for certain ports the advantages of their geographical locations. The rates from Chicago to Boston and New York, for instance, are the same; to Philadelphia they are two cents per 100 pounds less than to New York; to Baltimore the differential is three cents.

One might expect to find the reverse true with respect to ocean rates, but such is not the case. Boston is 175 miles nearer Europe than New York; New York is 150 miles nearer than Baltimore; but in spite of this ocean rates are the same for they are independent of such small differences in distance.

The St. Lawrence Waterway might be expected to serve as a highway for foreign trade for all points for which the rail rate to a port on the Great Lakes plus the ocean rate proves to be less than the sum of the existing rail rate to a port on the seaboard and the ocean rate from that port. The only unknown quantity in solving such a problem is the probable ocean cost from the different lake ports, for the existing rail rates are known and the existing ocean rates may be averaged.

Perhaps the best way of estimating future ocean rates from lake ports is by considering differentials which exist between the North Atlantic Ports, the Gulf Ports, and the South Atlantic Ports. From the Gulf Ports to the United Kingdom the distance is some 5,300 miles; from New York it is about 3,600 miles; from Chicago by way of the Great Lakes and the St. Lawrence River the distance is about 4,300 miles. Referred to New York the distance of the Gulf Ports from Great Britain is about 45 per cent. greater, and of Chicago it is about 20 per cent. greater. The rates from the Gulf Ports, however, are only 20 per cent. greater than those from New York.

It is apparent that these differentials are somewhat arbitrary and not a function of the distance, but it is likely that rates to Chicago will be subjected to a differential which approximates that of New Orleans on account of the short navigation season and the delays to shipping in the connecting channels.

Probably the bulk of the foreign trade of the area tributary to the Great Lakes Ports will be with northern Europe, though it is more likely that a comparative rate situation applying to the Mediterranean ports, those from Chicago probably will be 20 per cent. greater; from Cleveland, they will be about 12 per cent. greater. Applying these percentages to the average ocean rates out of New York, the costs from Chicago to foreign destination will approximate five cents per 100 pounds more than from New York and from Cleveland they will be about three cents greater. This rate situation would operate so that goods having a land rate differential of five cents in favour of Chicago would move for export via Chicago instead of by way of New York, while for Cleveland the critical land differential would be three cents.

Knowing the land rate differentials it is possible to determine approximately the boundaries of the area tributary to the Great Lakes for foreign trade.

It is likely that there will be some foreign trade through Chicago by way of the Lakes-to-the-Gulf Waterway. The Mississippi-Warrior Service of the Federal Barge Line now makes available an export water rate which is about 80 per cent. of the corresponding all rail rate between interior points on the Mississippi River and the Gulf, and there is a small amount of this class of traffic out of Chicago at present.

The Great Lakes now serve largely as an alternate route to the seaboard for a limited number of commodities, principal among which is grain. For the Lake Superior ports this alternate route carries over 90 per cent. of the eastbound grain movement; for the Lake Michigan ports the percentage is about 36.

The general cargo trade to the seaboard by way of the Great Lakes is in very much the same situation, the Lake Superior ports obtaining a larger percentage of traffic. For a long time inter-lake package freight service was operated by the railroads; both rail rates and lake rates were considerably lower than they are now, and a larger differential both absolute and proportional, existed between them. The so-called Panama Canal Act required the railroads to relinquish their boat lines, and in the readjustment which followed the boat services to Duluth-Superior retained a comparatively large differential while those to Lake Michigan found theirs reduced. As a result the volume of this class of traffic between Lake Michigan ports and eastern points has been seriously decreased.

It has been advanced by local interests that this lake-rail differential should be increased, for while the unit profit to the boat lines would be decreased correspondingly, the gross profit would be larger on account of the greater volume of trade. There is little question but that a greater volume of trade would result from a larger differential, for in this way the disadvantages of an inferior service would be overcome. Experience only would show whether the boat lines would profit by this change.

DOMESTIC COASTWISE TRADE.

There are several classes of domestic coastwise trade in which Chicago has a direct interest and for which the rate situation requires consideration. These are Lake Michigan and inter-lake trade, coastwise trade by way of the Lakes-to-the-Gulf Waterway—ex-New Orleans, and coastwise trade by way of the St. Lawrence Waterway.

Lake freight rates between Chicago and points on the west shore of Lake Michigan follow closely the rail rate, being approximately ten per cent. under it. On cross lake service the lake rate generally equals the rail rate. Inter-lake rates are subject to the difficulties just discussed under Foreign Trade; they follow the rail rates so closely that the shipper is not compensated for the inferior service. An increase in the differential should stimulate this class of trade, and might put the boat lines in a position to provide better service.

Coastwise trade by way of the Lakes-to-the-Gulf Waterway with interchange at New Orleans will be controlled by the differential existing between the rates for the different services available. This class of traffic will therefore be limited, undoubtedly, to service to Pacific Coast ports where the long cross country rate is comparatively high.

Domestic coastwise trade by way of the St. Lawrence River will find a rate situation similar to that developed in the case of foreign trade, complicated somewhat, however, by the addition of a short rail haul at the other end of the water route.

INLAND WATERWAY TRAFFIC.

For freight taking class rates it is likely that the barge services to be established on the Lakes-to-the-Gulf Waterway will follow the example set by the Federal Barge Line and quote all water or joint rates of which the part performed by the Barge Line will carry about 80 per cent. of the corresponding rail rate.

The experience of the Federal Barge Line indicates that where the water haul is not too long compared to the alternate rail haul, territory some distance back from the river may be served. But the cost of water transportation over long distances is largely a function of the distance so that there is a limit beyond which joint rail and water costs would exceed those by an all-rail route.

COMMODITY TRAFFIC.

LUMBER AND OTHER TIMBER PRODUCTS.

Chicago is the principal lumber market of the middle west and one of the largest in the country. During the year 1926 receipts amounted to about four billion feet and shipments to about two billion, the remaining two billion feet being consumed locally.

About 40 per cent. of the lumber received at Chicago comes from states in the lower Mississippi Valley, and almost the same amount from the Pacific Coast. Thus three-fourths of the lumber received at Chicago comes from points tributary to the lower Mississippi River, either directly, by short rail haul, or by water from the Pacific Coast through the Panama Canal.

With the exception of a negligible amount of lumber coming by lake from northern Michigan and Wisconsin and from Georgian Bay ports in Canada, all of the receipts at Chicago come by rail. The lake movement now averages less than ten million feet annually.

Within 50 miles of the Mississippi River, in the States of Tennessee, Arkansas, Mississippi, and Louisiana there is a daily combined capacity of saw mills of three times the average daily receipts of southern lumber in Chicago. Investigation of joint rail and water rates to Chicago, additional terminal costs included, indicates that there will be a differential in favour of water movement if a back downstream haul of some other commodity is provided. Investigations of other commodities indicate that downstream movements will be available for return cargo.

The Louisiana—Texas Intracoastal Waterway, now under improvement by the U.S. Government to a depth of 9-ft., will make an all water route to Chicago available from a district which produces large quantities of lumber.

Pacific Coast Lumber, arriving at New Orleans by ship, might move to Chicago by an all water route; for there will be a decided differential in favour of such a movement if a back haul is available.

GRAIN.

Grain received at Chicago is either consumed locally, shipped to consuming centres in the east, or shipped east for export.

Practically all of the grain received at Chicago comes by rail, though a small amount is occasionally brought in by lake vessel in connection with marketing operations.

The consumption of grain at the eastern centres varies between 200,000,000 and 250,000,000 bushels annually. United States exports of grain of all kinds have averaged in the vicinity of 300,000,000 bushels a year since 1919. From one-half to two-thirds of this export grain moves out of the North Atlantic ports. There is therefore an export and domestic market of from 350,000,000 to 450,000,000 bushels of grain a year which is competed for by the western primary grain markets.

There is a much larger world grain market for which to compete than the figures of the United States exports would show. Participation in this larger market is determined by transportation costs.

A large part of the grain that moves out of Chicago by water is carried by deep-draft vessels to Buffalo, where it is unloaded into elevators and reshipped to New York and other eastern ports by railroad, or by barge over the New York State Barge Canal. Another route is by way of Georgian Bay ports, where the grain is reshipped by rail, either to Montreal or to points in New England. Next to the movement through Buffalo, the heaviest shipments are by the all-water route to Montreal.

There is no grain movement from Chicago to New Orleans for export. The ocean rates from New Orleans to Liverpool are from one to three cents higher than from New York, while the all rail rates to New Orleans and the rail and barge rates are considerably higher than those to the Atlantic Coast ports.

There are several projects, under way or contemplated, that may affect the cost of moving grain from Chicago to the seaboard. The first is the new Welland Canal, which will permit deep-draft lake vessels to pass between Lake Erie and Lake Ontario.

The proposed deepening of the principal harbours and interlake channels to 25-ft., a project now under investigation by the War Department, should have the result of reducing lake transportation costs.

The completion of the Lakes-to-the-Gulf Waterway will have some effect upon the movement of grain to the seaboard. Where a return cargo is available there will be a differential in favour of shipping by barge to New Orleans, but this requirement of back haul undoubtedly will operate to keep the downstream movement of grain from assuming very large proportions. It may also prevent the establishment of large rail-to-barge grain transfer facilities on the Illinois or upper Mississippi rivers.

The St. Lawrence River improvement is more likely to affect radically the movement of grain through Chicago than any other project under way or proposed. With deep draft navigation from the upper lake ports to the seaboard, large lake vessels may carry full cargoes of grain all the way to Montreal and ocean vessels of average dimensions may enter the lakes, proceed to Chicago, Milwaukee, and Duluth and receive return cargoes of grain.

SAND, GRAVEL AND CRUSHED STONE.

Due to prevalence of large deposits of sand and gravel and outcroppings of rock suitable for building purposes, the movement of those materials is largely a local one. Approximately 80 per cent. of the requirements of the Chicago market are supplied from sources within the Chicago Region. Short hauls prevail and so, in spite of the fact that these materials lend themselves to mechanical handling and may move in bulk, shipments by rail predominate over those by water in the order of about 6 to 1.

Rail transportation has the advantage over water in that it has greater flexibility as to points of delivery, hence the secondary haul by truck from storage yard to consumer is usually enough shorter to offset the advantage enjoyed by water transportation of cheaper production and cheaper transportation costs between pits and local river yards.

Any material decrease in the margin between rail and water costs would reduce the size of the zones tributary to the river yards and consequently the market for materials brought in by lake vessel. It would not affect the general market price in the Chicago District.

The movement of these materials into the Chicago District by lake has been increasing rapidly; this is largely due to the fact that this business is comparatively new and has not reached a state of equilibrium.

The completion of the Illinois Waterway is likely to put a stop to any material increase in the lake sand and gravel business; it way even make serious inroads upon it. Large sand and gravel pits below Joliet are located on the Des Plaines River. Direct loading of barges by dredges will be feasible, and materials may be brought into Chicago in carriers which are much more flexible than the lake vessels, and with a margin of saving which certainly will have an effect upon this lake traffic.

PETROLEUM AND PETROLEUM PRODUCTS.

Chicago early attracted the attention of oil men, both as a consuming market and as a distributing centre. Low cost of land, with rail and water transportation available, induced the industry to become grouped along the shore of Lake Michigan, in Indiana, close to Chicago.

Pipe lines from the Illinois and Mid-Continent fields conduct the raw petroleum to the refineries in the Chicago District. Refining operation in this area now approximates 110,000 barrels daily.

Most of the production takes place in three large plants, as follows:

	Daily Capacity—bbls.
Standard Oil Company	52,000
Sinclair Oil Company	24,000
Roxana Petroleum Corporation	18,000

There is also the plant of the Texas Oil Company at Lockport, Illinois, with a daily output of 4,500 barrels. There are many other smaller plants, but most of them do only limited processing and are of little significance in the general situation.

A comparative newcomer is the Bartles-McGuire Oil Company of Milwaukee which has established two units of a daily capacity of 1,000 barrels each with others to follow. This company does limited processing, but plans to ship its products from its wharf on the Indiana Harbour Canal to its distributing station in Milwaukee.

The local consumption of gasoline and light oil varies from 15,000 to 25,000 barrels a day. The balance of the production of the local refineries is shipped out in tank wagon, tank car and lake vessel. At present only the Standard Oil Company

utilizes lake vessels for the partial distribution of its products, though it is understood the Roxana Petroleum Corporation proposes the erection of distributing stations at Detroit, Toledo, Cleveland and Buffalo to be reached by boat.

There has been a very rapid growth in the consumption of petroleum products in the past few years, and the production in the Chicago District has kept pace with that growth. On the other hand the movement by lake has not experienced the same rate of increase, indicating there is inertia in establishing this method of distribution which takes time to overcome. As a result, while the growth in consumption may not continue at the same advanced rate the increase in volume of lake shipments may be protracted for a longer period.

BITUMINOUS COAL.

Shipments of bituminous coal via the Great Lakes amounted to 27,863,000 short tons in 1925, including vessel fuel. Of this total about 84 per cent. went to the United States ports and 16 per cent. to Canadian destinations.

The greater part of the coal moving on the lakes goes from the Ohio, Pennsylvania, West Virginia and Eastern Kentucky fields by rail to Lake Erie ports, via lake to Lake Michigan and Lake Superior ports, thence to destination by rail. This west bound coal furnishes return cargoes for some of the grain and ore vessels which discharge at Lake Erie ports and consequently a comparatively low freight rate by lake prevails.

The largest consumers of bituminous coal in the Chicago District are on the waterfront. Among these are the steel mills, the by-products coke and the gas plants, and the electric power generating stations. At present, however, only the independent steel companies and one large by-product coke company receive coal by lake as the others use coal which is not tributary to the lake routes or which is brought in by railroads in which the consumers are interested.

The bituminous coal received at Racine, Kenosha and Waukegan is largely for local consumption by various industrial users. That received at Chicago is for bunkering lake vessels. Practically all of that received at South Chicago and Indiana Harbour is used for making coke, largely for consumption in the blast furnaces.

It is believed that the present rate situation is favourable to a continued and material increase in the volume of coal receipts in the Chicago Region by lake. There is a large and growing demand for certain grades of eastern coal used in the production of metallurgical and gas house coke that is unlikely to be affected by any change in prices of other grades of coal from mid-western fields.

Michigan City, Indiana, is some 375 miles from the eastern Kentucky coal fields as compared with 325 miles for Toledo. If a rail rate from these fields to Michigan City were allowed which compared favourably with that to Toledo a considerable portion of the Lake Michigan coal trade could be handled through Michigan City instead of by way of the Lake Erie ports.

Another development which would be likely to affect the movement of coal through the Chicago Region would be the establishment of facilities for the receipt by rail and shipment by lake of coal from the Danville fields of northern Illinois. Investigation leads to the conclusion that this coal may be delivered at Duluth by rail and lake through Chicago at a price slightly less than that asked for the delivery of eastern coals there.

The completion of the Illinois Waterway will have some effect upon the movement of coal into the Chicago Region by water, but only to a limited degree as most of the important coal deposits in Illinois are some distance from water and short rail hauls from mine to waterfront will be required.

ANTHRACITE.

Most of the anthracite produced in this country is mined in the fields of Pennsylvania which are confined to a very limited area of the north-eastern and eastern part of the state. It is significant that while the production of anthracite doubled between 1890 and 1913 there has been no consistent increase since the latter date.

The bulk of the anthracite mined is consumed east of the Allegheny Mountains. Perhaps five per cent. of the production is exported, largely to Canada, and about seven per cent. is shipped west of the Alleghenies.

Railroads serving the anthracite trade regions, together with their western connections, handle most of the coal mined. A large tonnage is moved by rail to Lake Erie ports for shipment to Canadian ports and to Lake Michigan and Lake Superior ports in the United States. While this movement has been an important one in the past, the business has been steadily declining in recent years.

This general decline in consumption of anthracite in the north-west has been attributed partly to the fact that these regions are more remote from the mines than the eastern markets and consequently are more completely shut off from the use of this fuel during strike periods.

There has been a more marked decline in use of this fuel in the Chicago Region. This is probably the result of the fact that Chicago is in much better contact with more varieties of substitute fuels.

Among the various reasons to which has been attributed the rapid decline of receipts of anthracite by lake, the principal and practically all-inclusive cause might be stated as the negligible saving in all-round costs of transportation between mine and consumer.

The combined effect of increased costs of unloading, storage and degradation is to reduce the apparent lake-rail differential of $1.54 a ton to about $0.50 a ton. This small margin must therefore cover increased costs of delivery from river yards to consumers, and accordingly the local territory that may be reached from river docks is very restricted.

The conclusion is more or less inevitable that the receipt of anthracite by lake is no longer a factor in the local market, and no foreseeable change is likely to make it so.

IRON ORE.

The Lake Superior region ranks first in the world as an iron ore producer, containing an estimated 1,500,000,000 tons of metallic iron in higher grade, readily available reserves, and an almost unlimited quantity of lower grade ore. The visible supply of 50 per cent. or better ore is good for 20 or 30 years at the present rate of use, but due to refinements in manufacturing, as well as the discovery of new reserves, it is likely that the higher grade ores will last for a considerably longer period. Of the iron ore produced during the season of 1923 about 1,600,000 tons moved to its final destination by all rail routes, the entire balance (about 59,000,000 tons) went by rail to the upper lake ports, thence down the lakes for consumption at the receiving ports or for rail movement to the interior.

Of these shipments Lake Erie ports received 44,500,000 tons and Lake Michigan ports nearly 13,000,000 tons. The ore delivered to Lake Erie ports is largely transhipped to interior steel districts in Ohio and Pennsylvania. That delivered to Lake Michigan ports is largely consumed by blast furnaces on the waterfront.

There appears to be every indication that the movement of ore into the Chicago region by lake will continue to increase for a number of years. Practically all of the steel companies have projects for expansion which will involve substantial additions to their receipts of ore. Most of them have unused tracts of land and dock space adjacent to their present locations which can be developed as required. One large independent producer has been improving a site for a new steel plant on the Indiana Harbour Canal. The market for steel products in the middle west is increasing rapidly, and the Chicago steel producers seem to have a firm grip on the territory.

LIMESTONE.

Limestone is used in large quantities for fluxing purposes in the manufacture of iron and steel. The principal source of this material is at Calcite, Michigan, on Lake Huron, though there are quarries elsewhere which are of minor importance in the trade. These quarries are so situated that direct loading of vessels from both the screening and washing plants and the stock piles is practicable.

There was no lake traffic in fluxing stone of record in 1910. In 1924 approximately 2,300,000 tons were received at the waterfront steel mills in the Chicago region, 2,900,000 in 1925, and 3,000,000 in 1926. This traffic is distributed in approximately the same proportions as the ore that is received by water. Part of it is unloaded by the same equipment, and increasing quantities by modern self-unloading vessels.

IRON AND STEEL.

Coincident with the growth in manufacture of basic iron in the Chicago region there has been a corresponding growth in the volume and value of iron and steel products, such as plate, tubes, pipe, rails and structural shapes of various kinds. Steel makers in Chicago have been in direct competition with those in the Pittsburgh district from the very beginning, but in the mid-western territory they now have the advantage of being nearer the market as well as having a better location with regard to raw materials.

In 1910 the shipments of iron and steel by water from the public harbours in the Chicago region were about 19,000 tons; in 1924, 37,500 tons; in 1925, 87,000 tons. The preliminary estimate for 1926 was 200,000 tons. These figures do not include shipments from Gary, for which published statistics are not available.

As the population of the cities on Lake Michigan and Lake Superior increases the market for iron and steel products tributary to the Chicago district by water will increase and in like measure for shipments by water.

The completion of the Illinois Waterway will bring the river cities as far south as Vicksburg and perhaps Baton Rouge and some of the territory back of them into the Chicago market. These points are now tributary to Pittsburgh. There is a movement of iron and steel products on the Ohio and lower Mississippi rivers, approximately 125,000 tons being received at the more important Mississippi River ports during 1925.

In 1925 over 1,900,000 short tons of iron and steel products were exported from the United States, one-third of which went to Canada. The Canadian territory is reached by Chicago manufacturers. At present 10 per cent. of the total United

States exports to Canada have been shipped from South Chicago by water. The opening of the St. Lawrence Waterway will put Chicago in better communication with the larger market in eastern Canada. It will also give Chicago manufacturers direct access by water to the other export markets of the world.

MISCELLANEOUS.

Nitrates.—Nitrate is a very important element in most forms of fertilizer. It is used in large quantities in the United States, and is largely imported from Chile.

In 1925 nearly 1,400,000 tons of nitrates and nitrogenous materials were entered at the various ports of the United States, of which over 1,100,000 tons came from Chile.

This commodity is more likely to reach our interior agricultural districts via New Orleans and the Mississippi System of Waterways than via the St. Lawrence Waterway and Great Lakes ports. The only states tributary to Chicago for trade of this character are parts of Michigan and Wisconsin.

Phosphates.—Phosphate rock is a raw material used for the manufacture of fertilizer. Sometimes it is used in the raw state, the rock being ground finely and applied to the soil. In the United States acid phosphate is produced more cheaply, sulphuric acid being combined with the phosphate rock in its manufacture.

Florida and Tennessee produce most of the phosphate rock in this country; Florida's production in 1923 being over 2,500,000 long tons; that of Tennessee being about 430,000 tons.

The phosphate rock quarries in Tennessee are mostly situated where they could reach either the Tennessee or Cumberland rivers by short rail haul, but this material is not likely to move to Chicago by barge unless a return cargo of some sort is available at least part way. The rock produced in Florida could be shipped via the St. Lawrence River after it has been deepened.

Sulphur.—Sulphur is produced in large quantities at points in Louisiana and Texas readily accessible to the Louisiana-Texas Intra-Coastal Waterway. As this waterway joins the Mississippi a short distance above New Orleans, an all-water shipment of this commodity to Chicago will be possible.

Sulphur is used mostly in making sulphuric acid, an important reagent in the fertilizer, paper, and steel making industries. There is a present consumption of this commodity of over 200,000 tons per year in the Chicago District and in the territory immediately tributary to it. Sulphur can be handled mechanically and lends itself to shipment by barge.

Silica Sand.—Silica sand is produced in large quantities along the Illinois River in the general vicinity of Ottawa, Illinois. It is generally refined at the pits and shipped by rail largely to points in the east, where it is used for moulding purposes, glass making, and abrasives. Five producers shipped approximately 16,000 cars in 1926, or 800,000 tons, of refined sand, going to Cleveland, Detroit, Toledo, Sandusky, Buffalo, Niagara Falls, and points in Canada.

There have been a few experimental shipments by water of crude silica sand but none of the refined sand for which there is the larger market. With the completion of the Lakes-to-the-Gulf Waterway, this material may move by barges to Chicago where it could be transferred directly to ships.

Shipbuilding and Repair.—The Chicago Region has not been of much importance in recent years as a centre of shipbuilding and repair. In spite of a comparatively favourable situation as to supplies and costs of materials the labour market has generally been such as to prevent any extensive development in this direction. The few dry docks on the Calumet River seem to be ample in capacity to care for present requirements for the repair of ships.

It may be that the demand for river barges, which should follow the opening of the Illinois Waterway, will result in the establishment of boat yards capable of producing this class of vessel.

In any event, as the traffic in the ports of Chicago grows, the facilities for repair of vessels should expand accordingly, else the traffic will disappear.

TRAFFIC IN GENERAL CARGO.

General cargo includes those classes of goods which ordinarily do not move in large enough quantities to warrant provision at the terminals of highly specialised equipment; such goods comprise the bulk of the traffic at a commercial port. Among them will be found the following:—

IMPORTS.

Raw sugar, bananas, other fruits, coffee, tea, dyewoods, rubber, rubber goods, burlap, cork, sisal and hemp, fish, cocoa, vegetables, miscellaneous foods, precious woods, manila, tobacco, cotton goods, bagging, machinery, automobiles, chemicals, glassware, cotton and unclassified.

EXPORTS.

Leather goods, dressed meats, lard, hides, flour and millstuffs, confectionery, miscellaneous foods, dry goods, rope, furniture, wax, copper products, iron and steel products, machinery, trucks, pipe, hardware, agricultural implements, engines, automobiles, pianos, wool, bags and bagging, binder twine, railway cars and parts and unclassified.

This class of water traffic might be separated into two groups: the first group including articles for use or consumption exclusively by individuals, such as clothing and foodstuffs; the second comprising raw materials for manufacture of articles not included in the first class, and also the products of manufacture.

A measure of volume of the first group for a given area is the population; a measure of the second group is value of manufactures.

During the past 45 years the bulk of the foreign and domestic commerce of the United States has been carried on through the five so-called North Atlantic ports of Boston, New York, Philadelphia, Baltimore and Norfolk. So far as the population and value of manufacturers in the area tributary to the North Atlantic ports have contributed to the general cargo movement through those ports, at least so far will the population and value of manufactures in the area tributary to the Great Lakes ports measure their potential traffic in goods of like character.

FOREIGN TRADE.

Foreign traffic in general cargo will be handled largely at the ports of Duluth-Superior, Milwaukee, Chicago, Detroit, Toledo, Cleveland, and Buffalo. Nearly half of the population of these port cities and their suburbs is to be found in the Chicago metropolitan district. The area strictly tributary to Chicago has about half of the population of the area tributary to all these ports; it has one-fourth of the manufactures, and its mean land haul to port is some 40 per cent. greater. Considering these factors, and bearing in mind that a large local population is the most potent one of all in attracting trade, it is not unwise to assume that about 40 per cent. of this traffic will centre in this region.

DOMESTIC COASTWISE TRADE.

Comparison of Traffic Possibilities.

Year	North Atlantic Ports	Great Lakes Ports
Population of Tributary Area.		
1910	72,766,000	51,934,000
1920	84,713,000	60,630,000
1940 (estimated) ...	———	77,000,000
1950 (estimated) ...	———	94,500,000
Area of Hinterland (square miles).	1,500,000	1,100,000
Value of Manufactures of Hinterland.		
1910 ...	$18,500,000,000	$14,100,000,000
1920 ...	$56,400,000,000	$43,500,000,000
1940 (estimated)	———	$55,000,000,000
1960 (estimated)	———	$78,500,000,000
Coastwise Trade in General Cargo (tons).		
1920 (actual) ...	6,877,100	5,750,000
1940 (potential) ...	———	6,765,000
1960 (potential) ...	———	9,640,000

As far as Chicago alone is concerned perhaps 25 per cent. of this potential traffic may be expected to pass through its port. It has nearly 50 per cent. of the lake front city population; its hinterland has 37 per cent. of the population of the entire area tributary to the Great Lakes ports and about 31 per cent. of the value of manufactures.

The mean land haulage to Chicago is 283.5 miles, as compared to 174 miles to the other lake ports. With coastwise traffic this is probably much more of a factor than with foreign trade, for with the former alternate land transportation is available and will be used in cases where the land haul to water is comparatively great.

INLAND WATERWAY TRAFFIC.

Comparison of Traffic Possibilities.

Year	North Atlantic Ports	Chicago
Population of Hinterland.		
1900	11,370,000	18,820,000
1910	15,642,000	21,719,000
1920	18,518,000	24,653,000
1940 (estimated) ...	———	31,000,000
1960 (estimated ...	———	36,500,000
Value of Manufactures of Hinterland.		
1900 ...	$4,428,000,000	$3,000,000,000
1920 ...	$17,364,000,000	$14,500,000,000
1940 (estimated)	———	$19,400,000,000
1960 (estimated)	———	$27,700,000,000
General Cargo Traffic (short tons).		
1920 (actual) ...	3,700,000	———
1940 (estimated) ...	———	5,400,000
1960 (estimated) ...	———	6,600,000

None of the foregoing estimates take into consideration physical conditions which might affect the flow of traffic. Among these considerations are: Population density, railroad density, average length of land haul to port, length of navigation season, and average fog conditions.

In the case of foreign and domestic trade the combined effect of these factors is believed to be negligible. Population density and railroad density will be equivalent for the years compared; while average distance to port favours the Great Lakes ports so much as to offset disadvantages of a shorter navigation season and more severe fog conditions.

With inland waterway traffic, however, population density and railroad density are so much in favour of the area tributary to the North Atlantic ports as to warrant the reduction of the estimates of potential traffic for Chicago by 66 per cent.

It seems reasonable, therefore, that between now and the years 1960 to 1970 there will have been a sufficient increase in the population and productivity of the areas tributary to Chicago to warrant the following estimates for potential traffic in general cargo.

ANNUAL COMBINED TRAFFIC.	Tons.
Foreign Trade ...	7,850,000
Coastwise Trade ...	2,450,000
Inland Waterway Trade ...	2,200,000
Total	12,500,000

Considering foreign traffic in general cargo, receipts at the North Atlantic ports in 1920 were approximately 70 per cent. of the shipments. The same ratio is likely to apply to the potential foreign traffic at Chicago for the trade characteristics of the tributary areas involved are quite similar for the times between which comparison is made.

With potential coastwise traffic the situations as to tributary areas are not sufficiently comparable to make a parallel assumption with much accuracy. The same is true with regard to inland waterway traffic.

Summary of Future Traffic Possibilities.

These investigations of existing and potential waterborne commerce in the Chicago Region are made to insure that the plans for modification of existing harbour facilities and for location, layout, and design of future works of this character will make ample provision, in the major features, for all classes of water traffic of notable consequence.

There may be too much optimism expressed as to growth in water traffic in general; however, the object of these predictions is not to further the interests of waterway improvement, but only to insure adequate capacity in the structures proposed.

(To be continued).

Mackay Harbour Board.

The annual report of the Harbour Board of Mackay, east coast of Queensland, covers the Board Year ended March 31st, 1928.

REVENUE.

The total revenue for the financial year ended 31st December, 1927, amounted to £13,639 14s. 7d., of which sum £13,114 13s. 3d. was collected for harbour dues. The receipts for harbour dues were slightly less than the collections for 1926.

SHIPPING.

The arrivals of vessels in the port during the year 1927 numbered 178 with a registered tonnage of 477,895, as compared with 212 and 503,754 respectively, in the previous year.

The departures from the port numbered 177, with a registered tonnage of 472,970, as compared with 211 and 505,614 respectively in 1926.

Weather inclemencies were especially accountable for the lessened number of ships using the harbour in 1927.

WORKS.

During the year the work of building up the North Wall for a length of 500-ft. from the outer end, as directed by the Engineer for Harbours and Rivers, was completed. Electric lights were installed at the Harbour Board Landing; and they are proving of great assistance to all who have to use the landing. Boring operations were carried out on the old viaduct site by the Board's outdoor staff and workmen.

When operations closed at the Mount Bassett Quarry, the Acting Engineer had the plant thoroughly overhauled, and painted where required; and it is now in good order and safely housed.

RIVER.

The river has been a source of continual annoyance to the shipping interests during the year. Shifting sand-beds at the bar and in the river rendered navigation difficult, so much so that the leads had to be altered by the Harbour Master to assist vessels is coming in or going out of the river.

In March (ultimo) a flood washed out about 1,000 tons of stone from the Director Wall at the Devil's Elbow, and also damaged considerably the Harbour Board Landing; but it made no appreciable difference in the deepening of the river. In point of fact there is now more sand in evidence than formerly; and it may fairly be said that the River Improvement Scheme is a dismal failure.

OUTER HARBOUR SCHEME.

A determined effort was made during the year to formulate a scheme for a Deep Water Port for the district, which would do away with the expensive lighterage system, and provide the necessary facilities for the handling of inward and outward cargoes, and the district's ever-growing trade. To that end a deputation from the Board waited upon the Hon. W. Forgan Smith, Deputy Premier, in August, and that gentleman named three requirements as a basis for an investigation of the scheme, viz.: (1) Is the scheme feasible, and can it be carried out? (2) Will it do all that is claimed for it? (3) Will it impose an undue strain of taxation on the shoulders of the people?

Upon the return of the deputation to Mackay Mr. Joseph McDowell, late Resident Engineer, Government Railways, was engaged by the Board to prepare and formulate a scheme upon the lines laid down by the late Mr. T. W. Keele and Mr. Cullen in their 1911 proposals. Very careful boring operations were carried out under his directions over the site of the proposed viaduct between Flat Top Island and the mainland to join up with the present railway system; and the absolute suitability of the strata to carry such a viaduct was determined beyond all doubt. Mr. McDowell's estimate for the complete formulation of the scheme was £565,000; and a further estimate was carefully prepared to show the revenue to be derived therefrom whereby it was clearly shown that sufficient money would be available to meet the interest and redemption charges not only upon £565,000, but even upon £750,000 if such a sum were necessary, after allowing a full margin of provision for working expenses and incidentals. And all this could be effected without adding any extra burden of taxation whatever to the people of the district. The cost to the community last year of the present obsolete old system of lighterage amounted to no less than £128,000.

A deputation from the Board, accompanied by Mr. McDowell, placed the foregoing figures before the Premier in November, and Mr. McCormack promised to inquire fully into the matter. Subsequently a reply was received from the Government setting out the dangers to be expected from cyclonic disturbances, and expressing disagreement with Mr. McDowell's estimates for the construction of the breakwater at the northern end of Flat Top Island. The tone of the reply altogether suggested that the Government had definitely turned down the scheme; but later Mr. Forgan Smith, on the occasion of a visit to Mackay, did not hesitate to inform a deputation from the Board that the Government "had not turned the scheme down." And at this point it is well to mention that the Government is now considering an application from the Board for permission to commence the construction of a breakwater at Flat Top from its revenue. The Board could expend £12,000 per annum in the building of the proposed breakwater, and at the same time be in the position to meet its present engagements with the Treasurer.

Though no finality has been reached in connection with the Outer Harbour Scheme, it is predicted that with this great sugar-producing district having an output of £2,000,000 worth of sugar annually, the present extravagant and old-fashioned method of handling its cargoes will be eliminated, and the so-long overdue necessary, speedy and efficient system which the Board advocates, adopted.

SUGAR.

The total production of raw sugar from the Mackay areas from the season 1901-2 to that of 1927-8 reaches 1,129,355 tons, the figures for the season 1927-8, 97,741 tons, being the highest yet recorded, the previous record being attained in 1925-6, with a total of 86,894 tons.

The value of sugar produced during the season just ended amounted to £2,000,000 from the various mills in the district.

BANANA GROWING.

During the year considerable interest has been taken in the prospects of establishing this new industry in the district, and already many of the farmers have planted out "suckers." The market for this fruit is assured, as the industry is protected from Fijian competition; and the locally-grown bananas are superior to the southern article to which they are accustomed. Through the courtesy of the Hon. W. Forgan Smith, an expert from the Department of Agriculture and Stock, made a visit to the district during the year, and furnished valuable advice to the farmers interested, and no doubt in the near future the banana trade in Mackay will be of considerable importance.

NEW SHEER LEGS FOR THE CANADIAN GOVERNMENT.

Messrs. Day, Summers & Co., Ltd., have just completed a set of sheer legs for the Canadian Government in very short time.

The order was for a set of sheers to lift 35 tons for the Hudson Bay Railway, and was placed by the Department of Railways and Canals.

The enquiry first came through in the early months of the year, but the contract was not placed until 23rd May. Delivery was required in Montreal by 1st September, 1928.

A new design had to be got out to meet the special conditions, but the contract was completed and the legs and machinery were shipped from Southampton on 16th August.

The following are particulars of the legs and machinery: Length of front legs, 61-ft.; overhang from perpendicular, 30-ft.

The hook is arranged to lift to a height of 40-ft. above the dock wall, and to drop to 20-ft below the dock wall.

The sheers are of Day, Summers & Co.'s latest type with inclined screw for traversing the back leg. The hoisting winch is of spur gear driven type with change speed gear and clutch for throwing the engine out of gear if necessary. The engines are horizontal steam engines with two cylinders 8-in. diameter, and are arranged to drive either the traversing gear or hoisting winch independently. The inclined traversing screw is driven through cast steel bevel gearing.